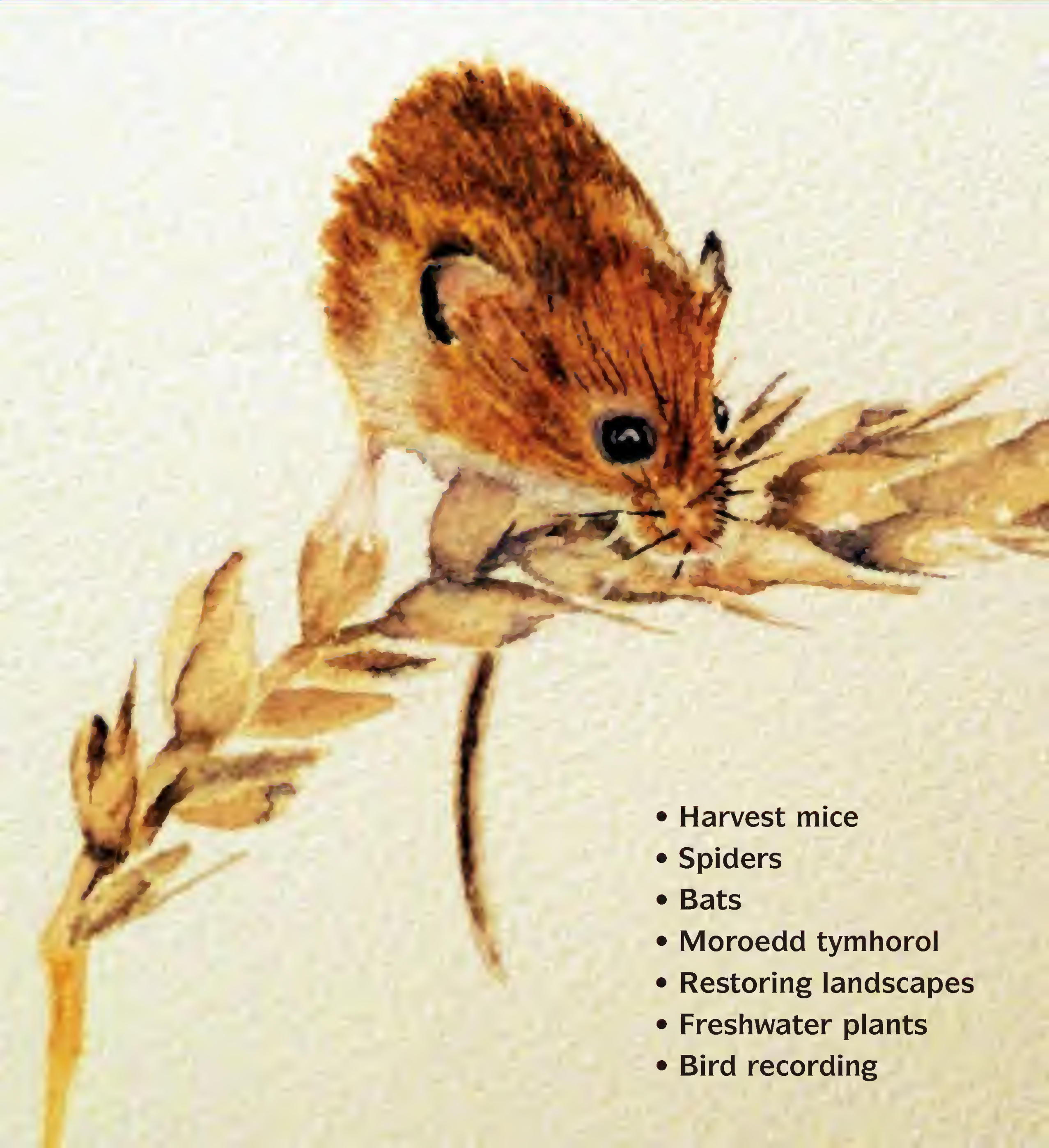
NATUR CYMRU

Nature of Wales

Number/Rhif 53 • Winter/Gaeaf 2014-15



- Harvest mice
- Spiders
- Bats
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CNC/NRW

GOLYGYDDOL EDITORIAL

Mae James Robertson wedi bod yn golygu *Natur Cymru* ers y rhifyn cyntaf yn 2001, ac eithrio rhifynnau 40-42 pan gymerodd Huw Jenkins yr awenau am gyfnod. Mae James am gymryd egwyl fach arall rŵan, a Phanel Golygyddol fydd wrth y llyw wedyn, er bod James wedi golygu nifer o erthyglau'r rhifyn hwn. Aelodau eraill y Panel ar gyfer rhifyn 53 yw Mandy Marsh (Rheolwr Cynhyrchu), David Parker ac Ivor Rees. Yn y rhifyn hwn ceir dwy erthygl am famaliaid (llygod yr ŷd ac ystlumod), ynghyd ag erthyglau'n sôn am gorynnod ac adar. Mae gennym erthygl Gymraeg am fywyd gwyllt y môr, hefyd, ac erthygl dŵr croyw ynghylch Llynnoedd Cregennan, lle mae arolygon tanddwr wedi datgelu cyfoeth anhygoel. Os credwch ein bod angen mwy o erthyglau am greaduriaid di-asgwrn-cefn a phlanhigion, rhaid ichi ddisgwyl tan y rhifyn nesaf!

Yn y rhifyn diwethaf, ysgrifennodd Tim Birkhead am astudiaeth hirdymor ar wylogod Ynys Sgomer y mae wedi bod yn eu monitro ers deugain mlynedd. Roedd dyfodol ei waith yn y fantol ar ôl i Cyfoeth Naturiol Cymru benderfynu rhoi'r gorau i ariannu'r astudiaeth. Y newyddion da yw y bydd yr astudiaeth yn parhau am flwyddyn arall o leiaf, diolch i £12,000 a gasglwyd trwy danysgrifiad cyhoeddus. Cymdeithas Adareg Cymru a gyfrannodd y £1000 cyntaf. Efallai fod Natur Cymru wedi helpu rhywfaint.

Mae Llysgennad newydd Natur Cymru, Craig Dawe, wedi cychwyn yn ei swydd erbyn hyn, ac mae wedi recriwtio ei danysgrifwyr newydd cyntaf. Mae'n byw yn Aberteifi, a bydd yn mynychu digwyddiadau yn ne-orllewin Cymru dros y gaeaf. Os hoffech roi help llaw i Craig mewn digwyddiad, a wnewch chi gysylltu â Mandy yn y swyddfa ar ein rhif ffôn newydd 0300 065 4867.

Un cais bach arall i'r holl ddarllenwyr – rydym angen mwy o danysgrifwyr, felly dangoswch eich copi chi i bawb a allai fod â diddordeb, gan eu cymell i danysgrifio!

James Robertson has been editing *Natur Cymru* since number 1 in 2001, apart from a break for numbers 40-42 when Huw Jenkins took over. James is having another short break and an Editorial Panel is standing in, although James has edited several articles in this issue. The other members of the Panel for number 53 are Mandy Marsh (Production Manager), David Parker and Ivor Rees. This issue has two articles on mammals (harvest mice and bats), together with articles on spiders and birds. We also have a marine life article (in Welsh), and a freshwater article about the Cregennan Lakes, where underwater surveys have revealed incredible richness. If you think we need more about invertebrates and plants, you'll have to wait for the next issue!

In the last issue, Tim Birkhead wrote about the long-term study of guillemots on Skomer which he has overseen for 40 years. The future of this was in doubt after Natural Resources Wales decided to stop funding. The good news is that the study will continue for at least one more year, thanks to £12,000 raised by public subscription; the first £1000 came from the Welsh Ornithological Society. Maybe Natur Cymru helped a little bit.

Our new Ambassador for Natur Cymru, Craig Dawe, is now in post and has recruited his first new subscribers. He lives in Cardigan and will be attending events in south-west Wales over the winter. If you would like to help Craig at an event, please get in touch with Mandy in the office on our new phone number 0300 065 4867.

If, like me, you are unable to read the Welsh article, please remember that you can always phone or email the office to request a full English translation of the text. One final request to all readers – we do need more subscribers, so please show your copy to anyone who might be interested, and if necessary do a little arm-twisting!

Geoff Gibbs

The search is on for *harvest mice in Wales*

Michael D Smith

Harvest mouse *Micromys minutus* Llygoden yr ŷd

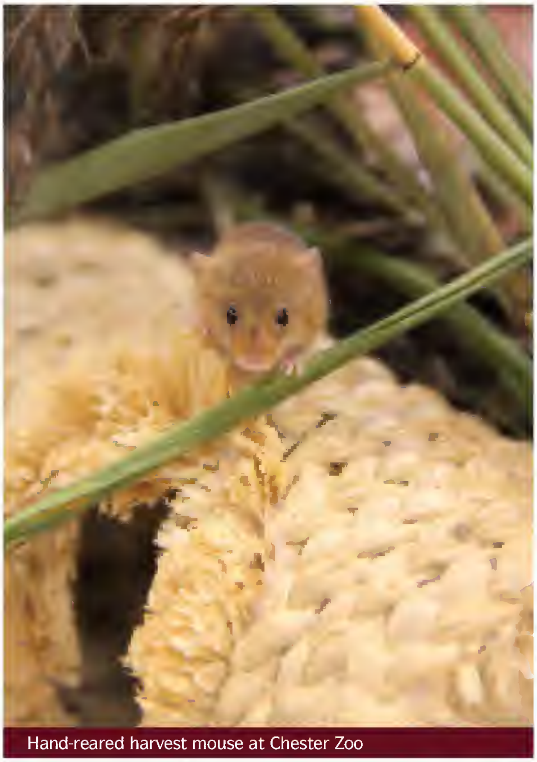
How widespread are harvest mice in the landscapes of Wales today and where should signs of them be looked for? ***BECKY CLEWS-ROBERTS*** *describes the habits of this elusive, very small mammal, and a collaborative project to improve knowledge of its distribution and habitat preferences.*

Illustrations of harvest mice frequently show a small charismatic creature with the tail coiled round a corn stalk and a woven nest. In reality their diminutive size, as Britain's smallest rodent, means that they often go undetected by even the most ardent mammal surveyors. Wales is on the far western fringe of a range that extends in a band right across Europe and Asia as far as the Korean peninsula. Biological Records Centre mapping by 10km squares in the 1970s showed they were widespread south and east of a line roughly from the estuaries of the Severn to the Tyne. In Wales the number of squares then with any records at all was only in the low 20s. A recent data search in 2013 by Roy Tapping (Cofnod Local Record Centre), mainly to identify areas of suitable habitat, found just 30 records in Wales since 2000 and only 139 in all, going back as far as 1895. These low figures prompted an increase in survey effort to understand the species status here, to determine where they might be searched for and whether any conservation measures might be needed. The harvest mouse is one of

the species being surveyed under the Mammals in a Sustainable Environment (MISE) project, which involves both professionals and the public. New records have already been reported and we are confident of more during the remaining year of the project. It is hoped that interested groups and individuals will then continue the search.

Life history

The harvest mouse *Micromys minutus* is a member of the rodent family. It is our smallest mouse, at only 5-7cm long and weighing 7gm, about the same as a 20p coin. In comparison, the wood mouse *Apodemus sylvaticus* is 11cm long and weighs 25g. Even to the untrained eye the harvest mouse is distinctive with its reddish-orange fur, white belly and blunt nose. The small hairy ears distinguish it from all other British mice. A long, prehensile tail, which no other European mouse has, is its most outstanding feature. In evolutionary terms the nearest modern relatives are a couple of tree-dwelling species found in the Far East. The prehensile tail is used as a 5th limb to assist with climbing grass stems. This enables the mice to feed in the stalk zone of long grasses where other small mammals cannot go. Their diet is varied, including seeds, berries and insects, whilst moss, roots and fungi can also be taken. They generally feed during the hours around dusk and dawn. Being warm-blooded with a high surface to volume ratio, they have high energy requirements.

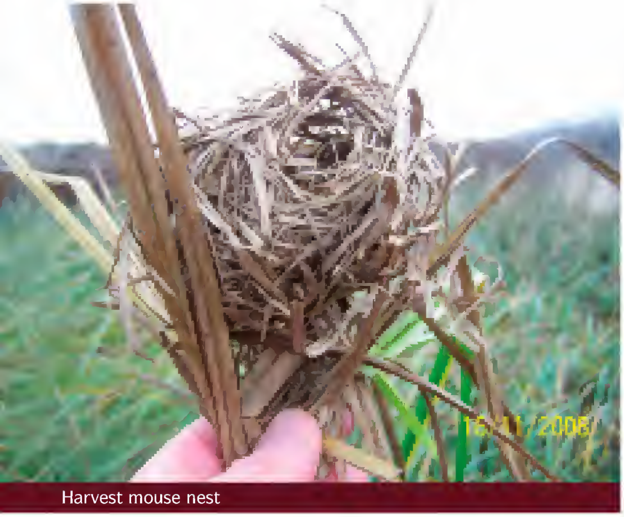


Hand-reared harvest mouse at Chester Zoo

Ceri Morris

As with other small mammals, their small size means a short lifespan of, on average, six months and rarely more than 18 months. In summer the females are capable of rearing litters of up to seven young every three weeks. After mating, the male has no further part in rearing the young. The female constructs the breeding nest, making a new one for each litter. It is possible for the female to have up to three nesting attempts in one season. The young spend their first two weeks dependent on their mother after which they begin to venture from the nest. Animals from early and mid-season litters can breed during that same summer, so the population can quickly increase. During the cold winter months populations can crash to as low as 1% of summer numbers. The highest mortality occurs in February and March.

Harvest mice are the only British rodents to build their nests off the ground attached to the still-living grass, so they are typically found in areas with tall grasses. Dormice also build woven nests, but they are not attached to living stems and so can easily be distinguished. Harvest mouse nests are tennis ball



Harvest mouse nest

Derek Crawley

sized for breeding, with smaller (4cm) nests made in winter. They make them from shredded woven grass.

Where to look

Traditionally, people associated harvest mice with cereal crops, which is where the common name came from. During the hay and corn harvests with hand scythes, mice could be seen running to the field margins. Nowadays, in most of Wales, the preference for silage over hay and modern, faster moving machinery, means the fields are less suitable for them. Even if present, they are less likely to be spotted from high up in the cabs of tractors. We now know that as well as in crops they can be found in a much wider range of habitats. This includes rush pasture, reed beds, uncut field margins, grassy hedgerows and even bramble and scrub. It has been suggested that, long before humans started to grow cereal crops, building nests off the ground may have evolved to exploit marshy habitats subject to intermittent flooding.

Harvest mice and other small mammals are essential sources of prey for several predatory birds and mammals. Declines in their populations will adversely affect species such as barn owl, kestrel and other birds of prey. Rare and specialist carnivores such as pine marten and weasels are also influenced by changes in populations of small mammals. Small mammal diversity and abundance can be an indicator of habitat quality.

The shortage of records from Wales could have been due to there being less of the types of habitat in which they were most likely to be noticed, or that suitable habitats are more fragmented. In the UK, harvest mouse numbers appear to have declined significantly since the 1970s. For this reason they were added to the UK Biodiversity Action Plan Priority Species list in 2007. While knowledge of their basic biology could be obtained by studying animals in captivity, any conservation action requires much more detail on their current status, natural fluctuations in populations and their distribution in different habitats. They are not legally protected.

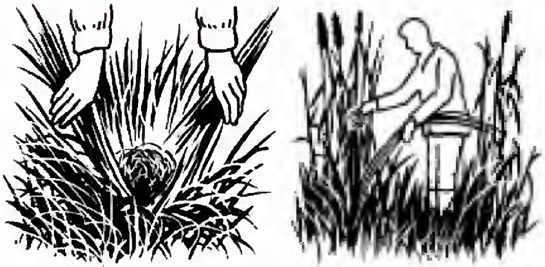
Surveying for harvest mice

As harvest mice move around off the ground most of the time, live trapping as for voles and other small mammals is ineffective. The three commonly used methods for detecting the presence or absence of harvest mice are:

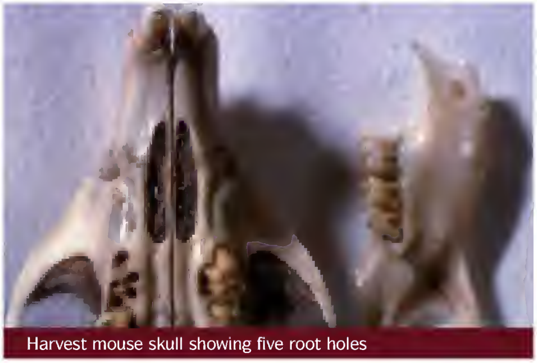
1. Searching for nests during winter

Breeding and resting nests are easiest to spot in late autumn and winter when the vegetation has died back, thus exposing them. They can be looked for in long grass, reed beds and field margins, or sometimes near ground level in grassy tussocks. Surveyors need to be aware that in mild weather harvest mice can continue breeding until December, or at least until the first frosts. It is important not to disturb a breeding nest. One way to determine whether or not they are still resident is to look for an obvious hole. Whilst in use for breeding, the female closes up the entrance/exit hole as she moves in and out as a way of reducing the risk of predation. Once the young have dispersed, a conspicuous hole is apparent. Simply tease tall grasses apart to look

How to search for nests...



Guy Troughton


The Mammal Society

Harvest mouse skull showing five root holes

along the stems or at the base of tussocks. With longer stems such as reeds, nests can be found at heights up to 1.5m, whereas in tussocks of purple moor-grass for example, they can be located close to the ground. An advantage of this survey method is that with several pairs of hands, large areas of suitable habitat can be covered relatively quickly. The MISE Project Officers will be carrying out nest searches during the winter of 2014-2015 and need volunteers to help. Equally, if you know of some suitable habitat, please let us know.

2. Dissecting pellets from birds of prey

Although not the most reliable method for detecting harvest mouse presence, pellets from birds of prey such as barn owls and kestrels can be dissected to look for the remains of harvest mice. The upper jaws and skulls of different small mammals are distinctive. For example, when the upper molar is removed, if five root holes are exposed, it indicates harvest mouse, if four a wood mouse and three a house mouse. Finds in pellets can then suggest where to direct effort to determine habitat use and population size.

3. Collection of droppings for DNA analysis using bait pots

The MISE project has been trialling bait pots filled with seeds (typically heat-treated millet). This has proved to be irresistible to passing rodents, and while feeding they leave behind plenty of droppings. MISE project partners at the Waterford Institute of Technology, Ireland, have been able to isolate DNA from these tiny droppings and can tell which species produced them. Using this method they have managed to identify wood mouse, bank vole, common shrew, and our target species the harvest mouse. To try and eliminate the more common species, the pots have been enclosed within wire mesh cages and attached to bamboo canes so as to be up amongst the grassy stalks where only the most agile of climbing rodents can reach. Recently bait pot surveys have been undertaken at four sites in north Wales. Results of the DNA analysis from two of these sites have shown that the majority of the samples were of pygmy shrew, the only other mammal small enough to fit through the mesh of the cages. Sadly, none were from harvest mice. The remaining tests will take place in coming months.

Becky Clews-Roberts *is the Project Officer for the MISE Project. Previously, she worked for the Mammal Society surveying for harvest mice.*

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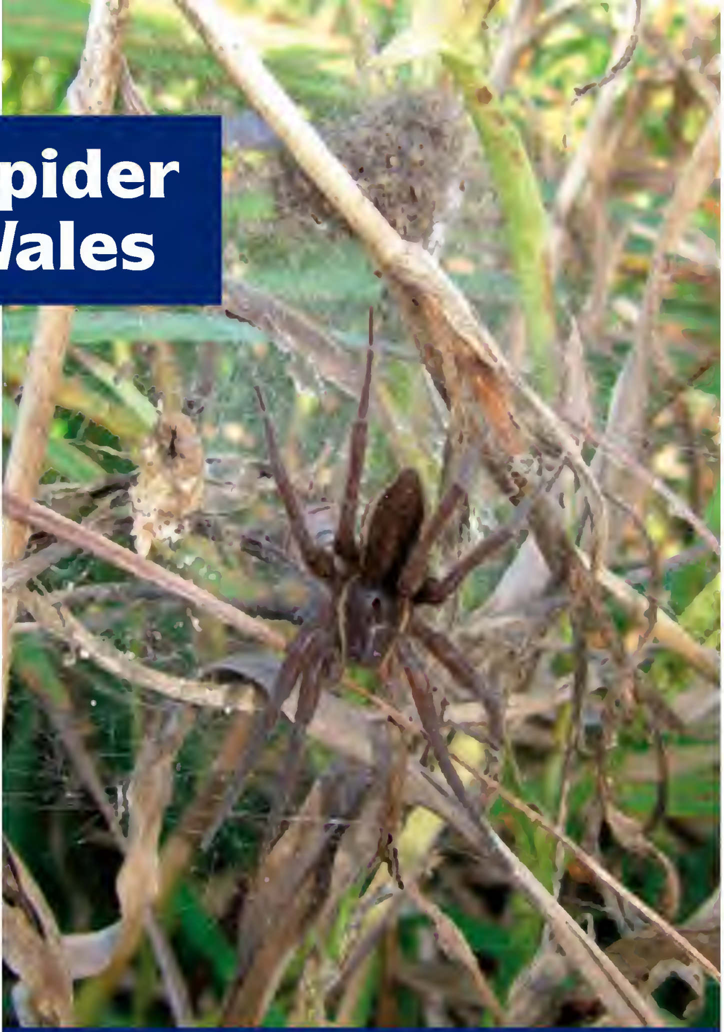
Llygod yr Ŷd

Llygoden yr ŷd yw llygoden leiaf Prydain, ac o'r herwydd pur anaml y caiff ei gweld. Yn wahanol i famaliaid bach eraill mae'n tueddu i fyw oddi ar y ddaear, gan ddringo i ganol cnydau grawnfwyd a phlanhigion hir, trwchus o'r fath, gyda chymorth ei chynffon hir. Gall llygod yr ŷd fridio'n gyflym drwy'r haf, mewn nythod a gaiff eu hadeiladu o laswellt wedi'i blethu a roddir yn sownd mewn coesynnau; ond gall eu poblogaethau grebachu'n arw yn ystod y gaeaf. Ychydig iawn o gofnodion o lygod yr ŷd sydd yng Nghymru; felly, y bwriad yw darganfod pa mor gyffredin ydynt. Gwneir hyn trwy chwilio am nythod, dyrannu pelenni adar ysglyfaethus a dadansoddi'r DNA a geir mewn baw.

The rare spider fauna of Wales

Although of modest size, Wales is notable for the diversity of its spider fauna, having almost five times as many species per unit area as England, and four times as many as Scotland. This richness has been catalogued for nearly two centuries, and is continuing to deliver exceptional records, as ***RICHARD GALLON*** *describes.*



Richard Gallon

The fen raft spider *Dolomedes plantarius* guarding its young on Crymlyn Bog.

From the 1830s John Blackwall, arguably the father of British arachnology, lived and studied spiders in the Conwy Valley. From his properties of Hendre House and Oaklands, just south of Llanrwst, he wrote a series of taxonomic papers and the two volumes of his *magnum opus*, *A history of the spiders of Great Britain and Ireland*[1,2]. This book is widely acknowledged to be the most beautiful ever published on British spiders; its imposing folio format and lavishly hand-coloured plates mark it out as a landmark in British natural history publication, and good copies now retail for well over a thousand pounds.

Blackwall's contribution to European arachnology was significant given that he described many of our native spiders for the first time. He also passed on his knowledge and specimen collection to another important British arachnologist – the Rev. Octavius Pickard-Cambridge, who visited him from Dorset. While poking around in the spirit room at Oxford University Museum I noticed a couple of large glass jars packed with tubes of preserved spiders labelled as coming from Blackwall himself – surely some of the oldest spirit-preserved spiders in Britain! John Blackwall himself lies beneath a slate headstone in Saint Mary Church cemetery, Llanrwst.

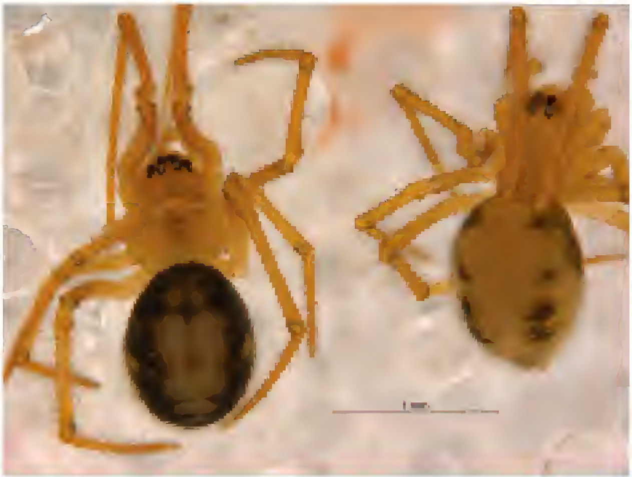
The importance of Wales to early British arachnology is undeniable, but we are also lucky to have a rich and diverse spider fauna too. There are 652 spider species currently known from Britain; 484 of these occur in Wales (0.023 species per square km). In terms of land area this compares very favourably with England (641 species, 0.005 species per square km) and Scotland (446 species, 0.006 species per square km). In Britain only four spider species are restricted to Wales: *Agroeca dentigera*, *Porrhomma rosenhaueri*, *Theridion hannoniae* and *Trogloneta granulum* – all occur on continental Europe.

Wales is blessed with a wealth of natural and semi-natural habitats, which are further diversified by altitude, aspect and our western position on the Atlantic seaboard: within just a few kilometres you can travel from mild coastal grasslands to arctic-alpine montane habitats. In consequence, this environmental variation supports a diverse and interesting spider fauna.

Montane habitats

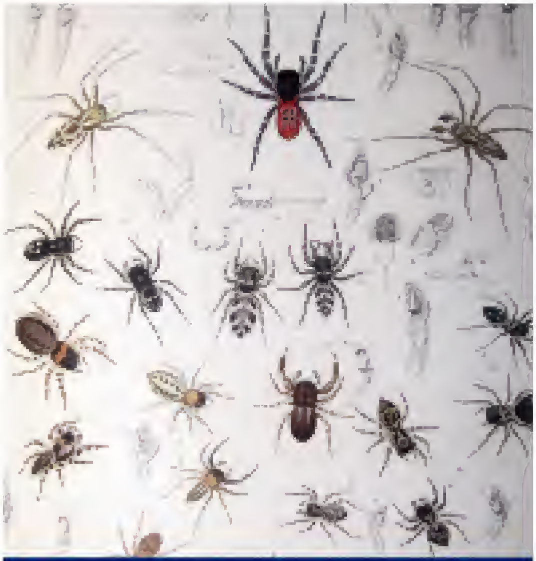
Wales is well known for its montane habitats, from the Brecon Beacons and Black Mountains in the south, through the Cambrians of mid-Wales, to Snowdonia and the Berwyn in the north. The higher peaks (> 750 m), particularly in the north, retain regionally important populations of arctic-alpine spiders, many at their southernmost limit in Britain.

The ant-mimicking spider *Micaria alpina* is perhaps our most iconic Welsh montane spider. It is absent from the Lake District, and only recorded from four mountains in Scotland and four in Wales. It was last recorded in Britain in 2002 when a pair was discovered on Carnedd Dafydd at an altitude of 1020m, scurrying around in the sunshine at the feet of an arachnologist eating his sandwiches while sitting on a rock!



Richard Gallon

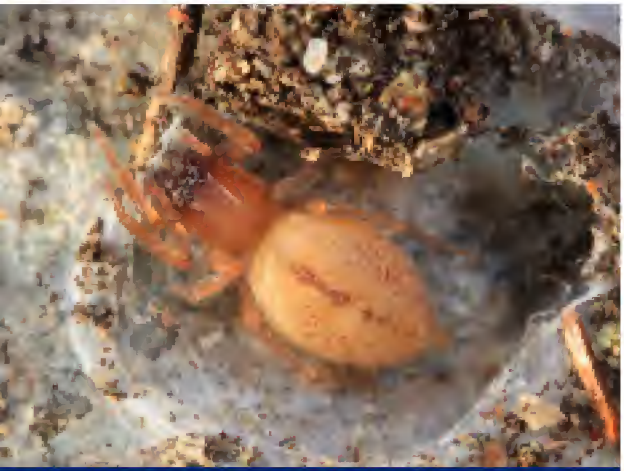
Rugathodes bellicosus, a sub-montane scree-dwelling spider.



A hand coloured plate from John Blackwall's book *A history of the spiders of Great Britain and Ireland*.

The summit felsenmeer habitat where *Micaria alpina* occurs also supports a suite of small montane-restricted money spiders: *Walckenaeria clavicornis*, *Entelecara errata*, *Tiso aestivus*, *Hilaira frigida*, *Meioneta nigripes*, *Oreonetides vaginatus*, *Mughiphantes whymperi* and *Piniphantes pinicola*. These spiders are found beneath rocks where they construct their webs to capture small prey items such as springtails. The money spiders *Monocephalus castaneipes* and *Typhochrestus simoni* also occur here, but occupy lowland habitats in Britain too. *Pardosa trailli* is a mountain wolf spider which actively hunts its prey amongst montane heath without the aid of a web; despite its comparatively large size, there are very few Welsh records of this species.

Rugathodes bellicosus is perhaps a more sub-montane spider and is not restricted to our very highest mountains like the previous species. This rarely recorded species was recently found to inhabit slate spoil heaps in Snowdonia, no doubt finding this man-made habitat a good facsimile of its natural scree habitat. Upland screes also support populations of the jumping spider *Neon robustus*, a spider which was only recognised as part of the UK fauna relatively recently. For a long


Richard Gallon

Clubiona genevensis female at Mynydd Mawr, Llŷn Peninsula, the northern edge of its British distribution.

time it was confused with its smaller, more widespread congener *Neon reticulatus*.

Coastal habitats

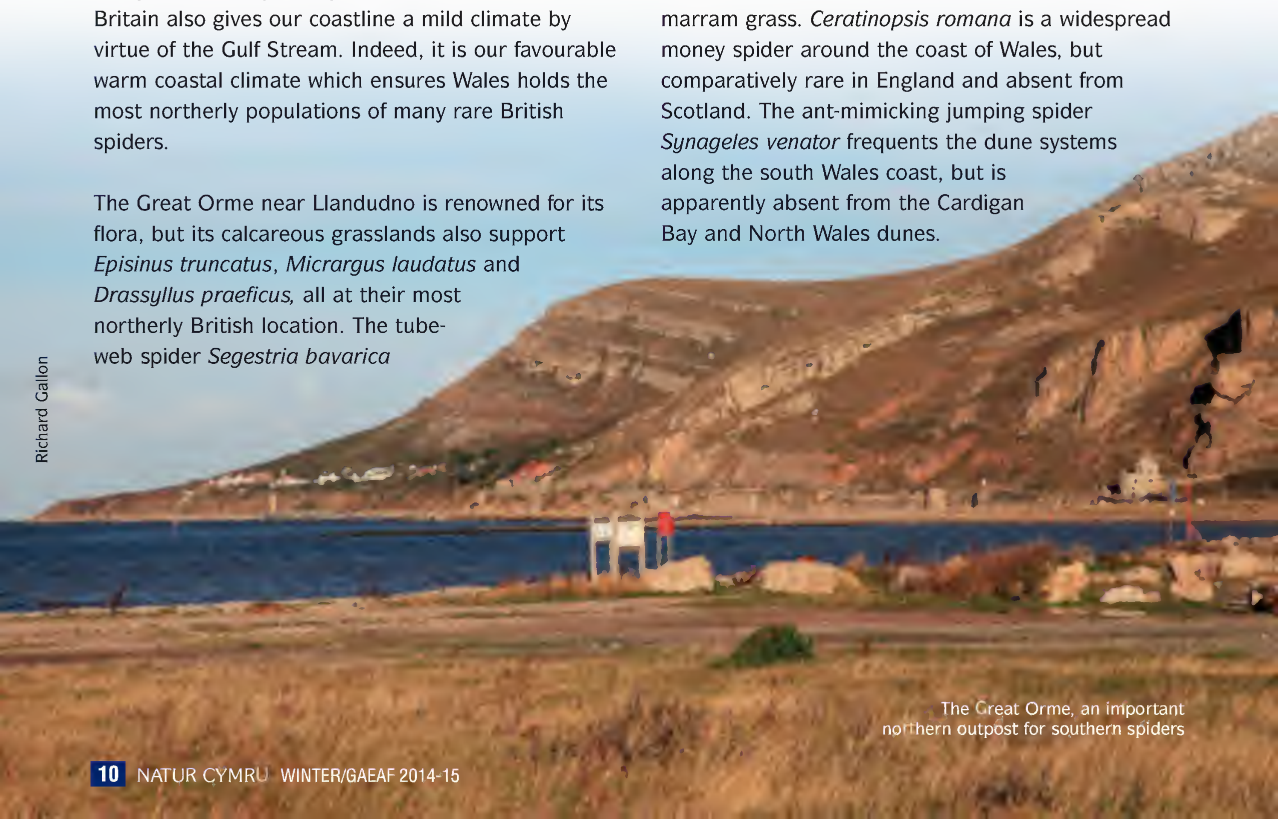
The 2740 km of Welsh coastline add a valuable set of species-rich lowland habitats to what is essentially an upland country. Our position on the west of Britain also gives our coastline a mild climate by virtue of the Gulf Stream. Indeed, it is our favourable warm coastal climate which ensures Wales holds the most northerly populations of many rare British spiders.

The Great Orme near Llandudno is renowned for its flora, but its calcareous grasslands also support *Episinus truncatus*, *Micrargus laudatus* and *Drassyllus praeficus,* all at their most northerly British location. The tube-web spider *Segestria bavarica* occurs here too in the fissured cliffs. This population, together with those on Puffin Island and the Little Orme, are the only known localities for this spider in Wales – the next nearest British location lies around 230 km to the south on Steep Holm island in the Bristol Channel.

At the very edge of their European ranges we find *Lathys stigmatisata* under stones on Ramsey island, and *Clubiona genevensis* on Skokholm, Ramsey and Mynydd Mawr at the tip of the Llŷn Peninsula.

An attractively striped jumping spider *Phlegra fasciata* is known from sparsely vegetated cliffs on Gower and also at Kenfig Burrows; surprisingly these are its most northern localities in Britain. In 2002 the cliffs at Marloes Sands became only the third area in Britain where the colourful spider *Callilepis nocturna* occurs.

The larger Welsh sand dune systems hold specialist spiders, with the highly camouflaged *Philodromus fallax* on the fore-dunes and tiny winter-maturing money spider *Mecopisthes peusi* hiding amongst marram grass. *Ceratinopsis romana* is a widespread money spider around the coast of Wales, but comparatively rare in England and absent from Scotland. The ant-mimicking jumping spider *Synageles venator* frequents the dune systems along the south Wales coast, but is apparently absent from the Cardigan Bay and North Wales dunes.


Richard Gallon

The Great Orme, an important northern outpost for southern spiders

By contrast *Haplodrassus dalmatensis* is found at its most northern British locality at Aberffraw and Newborough Warren on Anglesey, but has yet to be found on other Welsh sand-dune systems. *Haplodrassus minor* frequents coastal shingle, but in Wales is known from only three sites: Foryd Bay in Caernarfonshire (most northern British locality), West Williamston in Pembrokeshire and Ynyslas in Cardiganshire.

Ynyslas is also the only locality in Britain where *Agroeca dentigera* occurs. For years this population was misidentified as *A. lusatica*, a rare species from coastal Kent. Liverpool Museum is currently investigating the ecology of this species, which is a challenge to find.

Wetland habitats

Welsh upland acidic bogs hold a specialised spider fauna, providing habitat for rarities such as *Erigone welchi*, *Hilaira pervicax*, *Maro lepidus*, *Oryphantes angulatus* and *Clubiona norvegica*. *Erigone welchi* is known from only eight British sites, two of which are in Wales. It lives in saturated *Sphagnum* lawns in bog pools.

Our lowland wetlands are no less interesting, supporting the most northerly populations of the tiny metallic silvered spider *Theridiosoma gemmosum* (Anglesey). *Hypomma fulvum*, a red and black money spider, hides within reedheads; its Glamorganshire and Monmouthshire populations are the most western in Britain. *Dolomedes plantarius*, the Fen Raft spider, is our only protected Schedule-5 spider. This stocky imposing species hunts the water's surface, predating on other invertebrates trapped by surface tension. In Wales it is only found at Crymlyn Bog near Swansea, and an associated canal system, one of only three natural populations in Britain.

River shingle might seem an unlikely place to find one of Wales's largest spiders, but *Arctosa cinerea*, a large grey wolf spider, lives in burrows in the shingle of our larger rivers, and its Welsh populations are the most southerly and westerly in Britain. With a similar habitat requirement the rare, tiny, pale money spider *Caviphantes saxetorum* secretes itself beneath river boulders.

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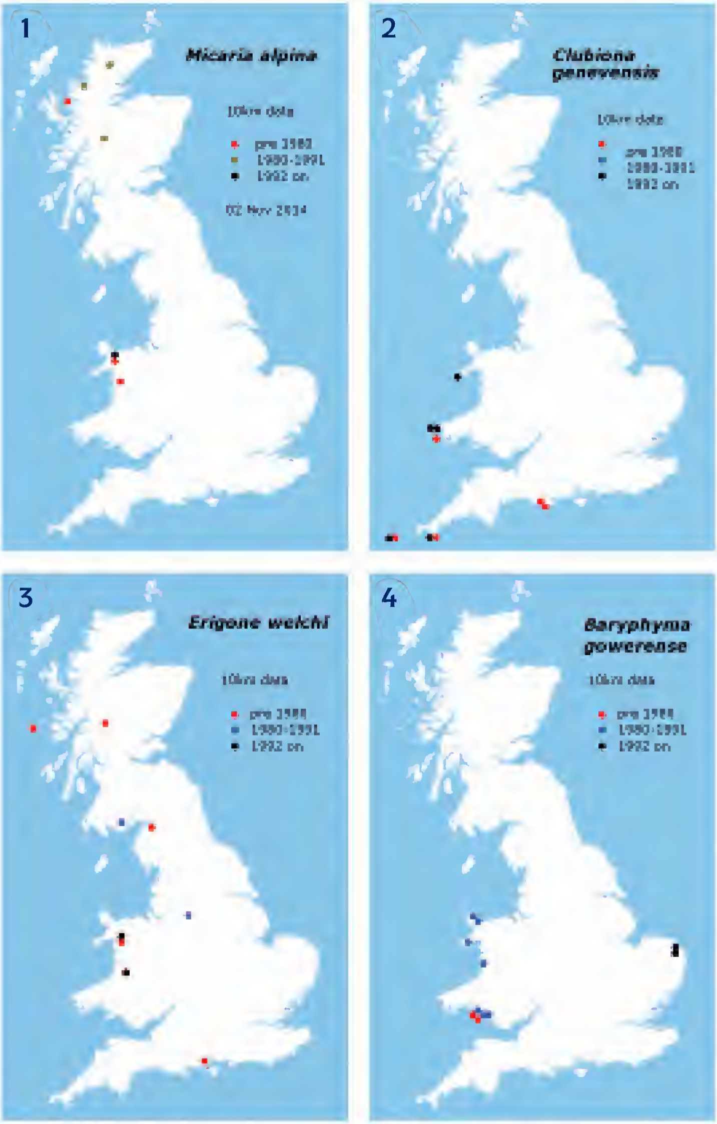
Ynyslas sand dunes where *Agroeca dentigera* occurs at its only British site.

Jumping spiders always attract attention, with their diurnal habits and inquisitive stance appealing to even the most casual observer. For a time *Heliophanus dampfi* was only known in Britain from Cors Fochno at the mouth of the Dyfi Estuary. This jumping spider has since been found in central Scotland, but is unknown in England and elsewhere in Wales. *Sitticus caricis* and particularly *Marpissa radiata* are very much fenland species, more characteristic of East Anglia. However, both of these jumping spiders find outposts in Wales, with *S. caricis* occupying the Anglesey Fens and *M. radiata* occurring on Crymlyn Bog. In Britain *Sitticus floricola* is essentially a spider restricted to the Shropshire/Cheshire mosses, with a single outlying population in southwest Scotland. It only just makes it into Wales near Wrexham, where it has been recorded at Vicarage Moss and Llay Bog.

As its scientific name would suggest, the wetland money spider *Baryphyma gowerense* has a close association with Wales, being first described from specimens collected on the Gower Peninsula in the 1960s. It has since been recorded from several wetlands along western Wales, from Oxwich in the south to Anglesey's Cors Erddreiniog in the north. It is a significant Welsh spider, since its only other British locations are a small number of fens in East Anglia.

Subterranean habitats

The arc of Carboniferous limestone which surrounds the South Wales coal measures supports one of our


1
Micaria alpina
10km data
pre 1980
1980-1991
1992 on
02 Nov 2014
2
Clubiona genevensis
10km data
pre 1980
1980-1991
1992 on
3
Erigone welchi
10km data
pre 1980
1980-1991
1992 on
4
Baryphyma gowerense
10km data
pre 1980
1980-1991
1992 on

British distribution of:
1: *Micaria alpina*
2: *Clubiona genevensis*
3: *Erigone welchii*
4: *Baryphyma gowerense*

most enigmatic spiders. *Porrhomma rosenhaueri* is Britain's only true troglobitic spider, showing a number of cave adaptations such as reduced eyes, pallid coloration and elongated legs. In Britain it is known only from two caves in Wales, Lesser Garth cave and Ogof-y-Ci, but no doubt occurs in other limestone fissure complexes in the region which are too narrow for human access.

Many readers will be familiar with the large cave spider *Meta menardi*, which can be found in a variety of dark habitats (caves, hollow trees, sewers and culverts), its white teardrop egg-sacs decorating many a cave ceiling. However, there is a second rarer species, *Meta bourneti*, which is superficially similar. In Wales this species has only been recorded from Puffin Island off the east coast of Anglesey in rat burrows, but it may well have been overlooked.

New discoveries

In the last few years two spiders have been discovered in Wales which are new to Britain. In July 2007 Simon Warmingham discovered *Theridion hannoniae* on Mynydd Bach near Maesteg[3]. This spider appears to be associated with some old stone gabion cages, perhaps suggesting that it has been introduced by humans. So far no further populations have been found in Britain.

An even more exciting discovery was that of *Trogloneta granulum* in 2012. Peter Harvey, the National Spider Recording Scheme Organiser, identified this species from a sample of spiders collected by Simon Warmingham near Swansea[4]. Simon had discovered his specimen beneath a rock on the 23rd March 2012. On hearing the news of this discovery earlier this year, and investigating *T. granulum* on the internet, I realised that I had also collected a single female of this species from a slate waste tip near Nantlle in North Wales on the 15th October 2012.

T. granulum represents a family of spiders new to Britain, so it is a shame that its identification came

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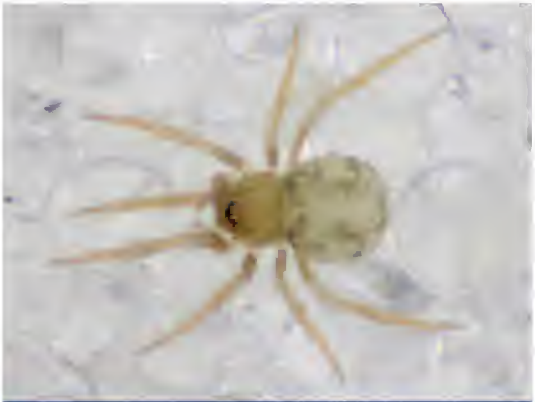

In Nantlle in 2012 a female *Trogloneta granulum* was found, a species new to Britain.

too late for its inclusion in the recently published revised checklist of British Spiders[5]. On the continent this tiny spider is known to live in upland scree habitats, so it may well be more widespread in Wales than we realise. However, searching for a 1mm long spider amongst deep scree is an arachnological needle in a haystack!

Conclusions

Despite its small size, Wales punches well above its weight in terms of its arachnological history and species richness. John Blackwall's residency ensured that many type localities of European spiders are in Wales. Recent discoveries such as *T. granulum* show that Wales can still produce exciting finds, and with so few active arachnologists in Wales we can no doubt expect more surprises from our spider fauna in the future.

Acknowledgments

I would like to thank Peter Harvey (Spider Recording Scheme) for allowing the use of the scheme's distribution maps in this article[6]. Thanks are also due to Darren Mann, James Hogan, Zoë Simmons and Ray Gabriel (Oxford University Museum of Natural History) for use of the automontage microscope (sponsored by the A. McCrae bequest). Adrian Fowles and Mike Howe (NRW) are also acknowledged for their support in working with Welsh spiders.

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Further information:

British Arachnological Society:
http://wiki.britishspiders.org.uk
Spider Recording Scheme:
http://srs.britishspiders.org.uk

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Corynnod Cymru

Mae cynefinoedd amrywiol Cymru yn cynnal 484 math o gorryn. Cafodd llawer o'r rhain eu dosbarthu am y tro cyntaf yn y 1830au gan John Blackwall a oedd yn byw yn nyffryn Conwy. Mae rhai o gorynnod prinnaf Prydain i'w cael yma ar derfyn eu dosbarthiad, mewn rhostiroedd mynyddig, arfordiroedd a gynhesir gan Lif y Gwlff, corsydd asidig a graean afonydd. Yng Nghors Crymlyn mae corryn rafftio'r gors galch ***Dolomedes plantarius*** yn hela creaduriaid di-asgwrn-cefn eraill ar wyneb y dŵr: dyma un o blith yr unig dair poblogaeth naturiol ym Mhrydain. Yng Nghymru ceir yr unig gorryn ym Mhrydain sy'n byw'n gyfan gwbl mewn tywyllwch ogofâu, sef *Porrhomma rosenhaueri.* Mae wedi addasu i'w gynefin mewn sawl ffordd, e.e. diffyg lliw a choesau hirion. Newydd gael eu darganfod y mae *Trogloneta granulum* a *Theridion hannoniae.* Mae'r olaf yn gysylltiedig â hen gaergewyll cerrig, sy'n awgrymu ei fod wedi'i gyflwyno gan bobl.

TNR - Geoff Caddick

Restoring ancient woods -

seeing the light

A veteran oak in a coniferous PAWS site, Wentwood

At this year's Wales Biodiversity Partnership Conference ***ALASTAIR HOTCHKISS*** *delivered a workshop on ancient woodland which looked at the Woodland Trust's approach to restoration management and its new 4-year restoration project. It was well attended by members of the private, public, and voluntary sectors, both local and national, and it's hoped that this positive response could spell good news for ancient woodland.*

Ancient woodland is one of our richest and most precious habitats. It's a complex ecosystem, with unique microhabitats and specialist species not found elsewhere, possibly dating back for millennia. It has great historic and cultural significance too, as a backdrop to human activity and settlement over centuries: an open book to our past.

So it's good to be in the 21st century, because the last century was particularly tough for our ancient woodland. The bulk of post-glacial woodland in Britain was cleared long ago, but by the end of the First World War the remaining woodland cover was severely depleted and long-standing native woods were fast being cleared, making way for commercial timber plantations. The Prime Minister at the time, David Lloyd George, admitted that Britain nearly lost the war more through lack of timber than through lack of food. Wartime timber uses ranged from pit-props in mining, to producing chemical compounds in wood distillation plants. Acetone was needed to produce cordite, a powerful propellant explosive used for firing shells without tell-tale smoke. Wood distillation was the only way Britain could make acetone until Russian-born biochemist Chaim Weizmann discovered how to produce it by bacterial fermentation using the bacterium *Clostridium acetobutylicum*. Given our inadequate wood supply, the British Government were keen to establish a close relationship with Weizmann, encouraging him to develop the process at Manchester University. Weizmann was also a Zionist, and a key proponent of a Jewish homeland in Palestine. Lloyd George and Foreign Secretary Arthur Balfour, grateful to Weizmann, consequently supported his Zionist aspirations. The Balfour Declaration was signed in 1917, stating His Majesty's government's support for establishing a national home for Jewish people in Palestine, and Chaim Weizmann later became the first president of the newly formed state of Israel. An interesting link: could Britain's lack of woodland in the early 1900s be partly responsible for international political problems today?

Unintended consequences

Back home, there was still a timber crisis. This led to the formation of the Forestry Commission in 1919. National policy guided the Forestry Commission and private landowners to not only plant large new areas of forest, but also fell 'unproductive' native woodland and 'improve' them by planting faster growing softwoods. The conversion of ancient woodland to conifer plantations continued until it peaked in the 1960s and 70s. Some landowners felt they were helping to build a sustainable national timber reserve. Others were reluctant, valuing their native Welsh oakwoods, but ultimately coerced by threats of compulsory purchase. But however you look at it, the delivery of government policy was incredibly successful, as exemplified by the sheer extent of converted woods. The most recent ancient woodland inventory (2011) details that in Clwyd, for example, over 60% (approximately 8000ha) of remaining ancient woodland has been cleared and re-planted, and 50% of that is still predominately dense conifers today. As an unintended consequence, the diversity of those woodland ecosystems declined significantly under year-round shade. Conversion of ancient semi-natural woodland to plantations was purposely focused on the most productive, fertile native woodland sites. This has perpetuated a perception amongst commercial foresters that native hardwoods are unproductive, a view which is based mainly on what remains – the most difficult, steepest, infertile sites.

WTPL Paul Glendell

Broadleaf trees need the light from gaps in conifer plantations

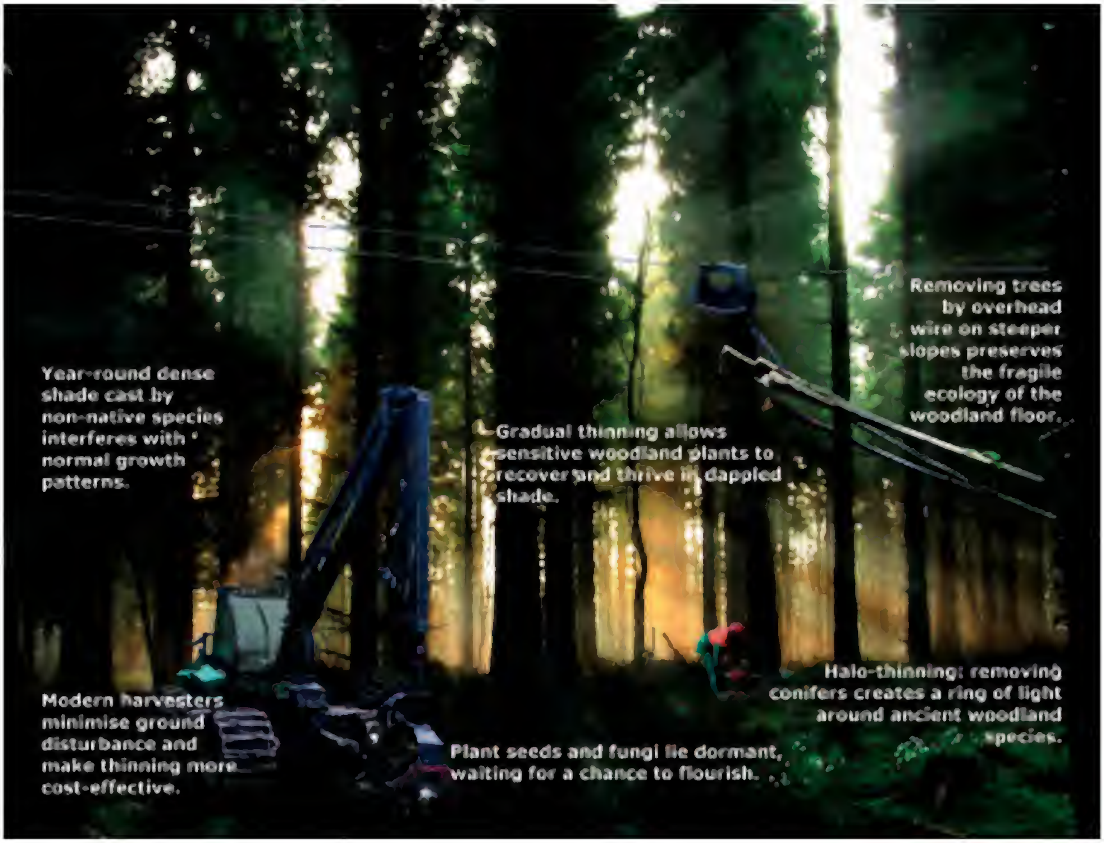
Defining ancient woodland

By the 1980s Britain's old native woodlands were finally becoming more widely valued by decision-makers. Policy changes were made to try and prevent further loss, and were helped by new concepts like 'ancient woodland', developed and promoted from the 1970s by Oliver Rackham and George Peterken. The idea was that woods with longer continuity of habitat tend to be ecologically richer than more recent woods. Although there was particular interest in primary woods, it was more practicable and reliable to have a class of woods dating from at least mediaeval times, before planting became common. These are our 'ancient woodlands'. But 'ancient' is a subjective term in relation to the age of the planet, so for practical reasons a threshold date had to be set for 'ancient' woodlands at AD1600. Other parts of the world have their own terms, like 'old growth' in the US for example. But whatever we call it, it is useful and powerful to have a concept like this.

Today, ancient woodland sites cover just 2% of the UK. Half of these are under shady plantations. These are ones referred to as Plantations on Ancient Woodland Sites (PAWS) – damaged, but not written-off. Remnant components of semi-natural ancient woodland habitats cling on, and we still have an opportunity to get them to thrive again. Many of these remnants are useful biological indicators of ancient woodland, generally comprising those species which are slow to colonise and develop, and which are rarely found outside ancient woodland. This work was pioneered by, amongst others, Francis Rose. Initial lists were based more on base-rich lowland woodland types, and are perhaps more useful for ash coppice in East Anglia than oceanic calcifuge oakwoods in Meirionnydd. Helpfully, the Countryside Council for Wales produced a report in 2008 compiling all of the existing regional lists in Wales[1]. These included common speces that you would expect, like bluebell *Hyacinthoides non-scripta*, wood anemone *Anemone nemorosa*, and yellow archangel *Lamiastrum galeobdolon*, along with less common indicators in Wales, like herb Paris *Paris quadrifolia*, thin-spiked wood sedge *Carex strigosa*, and wood barley *Hordelymus europaeus*. Lists of species like the filmy-ferns (*Hymenophyllum* spp.) help when in the humid acidic woods of the West. Similar lists of species that are indicative of long periods of ecological continuity (as a proxy for 'Ancient Woodland') are available for other taxa, including lichens[2] and invertebrates. The thing with all of these lists is that they are about cumulative totals of species – more, better, and stronger evidence that a site is a very old wood.

Not just timber

Some remnants are also species of conservation concern, and some have a demonstrable utilitarian value to humans (an increasingly important characteristic, it seems). One example is the tree lungwort lichen *Lobaria pulmonaria* which, as well as being an indicator of ecological continuity, is a conservation priority as part of the Lobarion community (NERC S42), and recent research has found potential for it to cure diseases affecting humans and our livestock[3]. *Lobaria* contains agents which degrade the prion-proteins related to often fatal neurodegenerative wasting diseases, including scrapie in sheep, mad-cow disease (BSE), and the human variant Creutzfeldt-Jakob disease (CJD). Coincidently, these potentially life-saving lichen extracts are produced by suspending powdered *Lobaria* in acetone – the very same chemical compound that, one hundred years ago, was in high demand to make the shells and bullets required to end lives. The bad news is


Year-round dense shade cast by non-native species interferes with normal growth patterns.
Gradual thinning allows sensitive woodland plants to recover and thrive in dappled shade.
Removing trees by overhead wire on steeper slopes preserves the fragile ecology of the woodland floor.
Modern harvesters minimise ground disturbance and make thinning more cost-effective.
Plant seeds and fungi lie dormant, waiting for a chance to flourish.
Halo-thinning: removing conifers creates a ring of light around ancient woodland species.

Woodland Trust

©Alastair Hotchkiss

Tree lungwort lichen *Lobaria pulmonaria*

that this lichen is having a hard time of late, declining across Europe in part due to the loss and damage of ancient woodland habitat.

The good news is that converting our rich ancient woodland sites to shady even-aged conifer crop plantations is, hopefully, now mainly a thing of the past. Government grants are no longer available to plant conifers on these ancient woodland sites (this was still happening in Better Woodlands for Wales schemes as recently as a few years ago). Yet our surviving ancient woodland is still under threat.

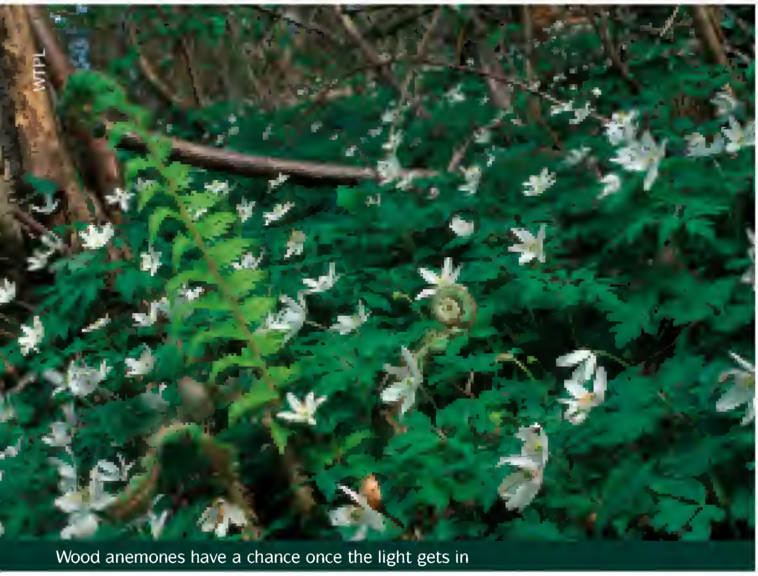
Seeing the light

We can't plant 'new' ancient woodland. So we must see restoration as a priority. There is an urgency to get started, but we must not rush the process. Our research with the Oxford Forestry Institute suggests that quickly exposing sites by clearing conifers and replanting with 'site natives' is not the answer, although it recognises it might sometimes be an option.

Woodland restoration should take time and patience, and at the heart of this is management of light. We need to get away from the clearfell culture, so prevalent in UK forestry. Some interesting work on global forest change was recently published in *Science*[4], with powerful online mapping hosted by the University of Maryland. Although probably designed more to illustrate global deforestation in the tropics, it was actually quite revealing about the variation in European silviculture. The UK's plantation mind-set was glaringly obvious, when scanning around mainland Europe (which, by contrast, I was told is only 7% plantation). Places like Southern Sweden, near Kalmar, do have small clearfell and restocking areas of maybe one or two hectares, if not smaller, but these are set amongst a much wider network of forest. When you travel to somewhere like Slovenia, east of Ljubljana, there is no clearfell at all. The whole map is green. But it is still being managed though – by continuous cover and selective felling practices. Slovenian timber is still extracted, and goes into a successful wood industry. It is in their national psyche not to clear forest, and has been banned by law in Slovenia since 1949. On return to mid-Wales, the stark contrast is clear. Vast swathes of red and blue are shown on the map, with hundreds of hectares of clearfell and restock sites.

For restoration, we should take a gradual and practical two-phase approach. First, identify threatened remnant features (flora hotspots, veteran pre-plantation native trees) and give them some breathing space by just clearing immediately around them (halo-thinning). Then, move towards a semi-natural composition in the long-term through conventional thinning, selective fells and continuous-cover forestry systems to create irregular stands. By being tolerant and using coniferous canopy cover as part of the process, we can increase both ecological and economic resilience. Our approach is about being pragmatic. One size does not fit all. The Woodland Trust is a leader in this area of sensitive restoration: we have practised it on our own sites, and are keen to encourage others to follow suit.

So, thanks to Heritage Lottery Funding (HLF), the Trust is now able to support and encourage other landowners to do this. We have a dedicated team



Wood anemones have a chance once the light gets in

focusing on 10 priority areas around the UK (with three in Wales), and over the next four years we aim to provide help and practical advice to over 1,000 woodland owners, visit and assess the condition of around 25,000ha of threatened ancient woodland sites, and facilitate moving 10,000ha into restoration management. The project also aims to run events and workshops to raise the profile and knowledge of ancient woodland restoration. By August this year we had already engaged with more than 120 landowners, with over 1500ha of ancient woodland assessed. In Wales, just under 700ha has been surveyed and assessed, with approximately 225ha already earmarked for restoration management.

We are in a time when Governments seem to be looking more at what conservation can do for people, using terms like the Ecosystems Approach, or the (apparently) less confusing phrase now being promoted, 'Integrated Natural Resource Management'. Whatever we call it, it is encouraging that restoration management for ancient woodland shows how conservation work can achieve biodiversity gains, meet landowners' objectives, and demonstrate a meaningful contribution to Wales's rural economy through producing saleable timber and generating jobs at the same time. The gradual approach is also better for water management and reducing soil erosion. But bringing thousands of lost ancient woods back to life is a huge undertaking, and the Woodland Trust is keen for other organisations and individuals to get involved with this ambitious project. We have a narrow window of opportunity and we must act now.

__Alastair Hotchkiss__ is Ancient Woodland Restoration Officer with the Woodland Trust. www.woodlandtrust.org.uk

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Coetiroedd hynafol

Coetiroedd hynafol yw un o'n cynefinoedd mwyaf toreithiog a gwerthfawr, ac all dim byd gymryd eu lle – allwch chi ddim plannu coetiroedd hynafol 'newydd'. Arweiniodd prinder pren yn ystod y Rhyfel Byd Cyntaf at greu'r Comisiwn Coedwigaeth yn 1919, a aeth ati'n ddi-oed i droi coetiroedd hynafol yn blanhigfeydd conwydd – gwaith a gyrhaeddodd ei benllanw yn y 1970au. Yn sgil hyn gwelwyd dirywiad mewn bioamrywiaeth, yn bennaf gan fod y coed yn taflu cysgod ar y ddaear drwy gydol y flwyddyn. Diolch i'r drefn, dechreuodd y duedd hon arafu yn y 1980au pan sylweddolwyd beth oedd gwerth coetiroedd hynafol, ond mae 'na lawer i'w wneud o hyd. Mae Coed Cymru yn dilyn system reoli newydd i geisio achub y safleoedd hynafol hyn.

Frank Greenaway

Bats in Wales:

the changing face of bat conservation over the past thirty years

The Welsh population of lesser horseshoe bats has more than doubled in the past 30 years.

Legal protection for bats provided the spur for county bat groups to form, to give advice to householders and to find out more about their local bats. As a result, and with the help of rapid technological developments, knowledge of the status and distribution of bats has been transformed in three decades; alongside which bat populations and distribution are constantly changing, as ***HENRY SCHOFIELD*** *explains.*

For me, it all started in a room in Ruthin in 1984, along with fellow members of the North Wales Naturalists Trust who had responded to an advert in the Trust's newsletter about bat training. A few years earlier the 1981 Wildlife and Countryside Act had set in place protection for all of the UK's bat species and there was a desperate need to have people on the ground to give householders advice about their newly protected residents. The drive to train up bat workers and support a burgeoning bat conservation movement was supported by the newly formed Bat Project; this was a collaboration between the Flora and Fauna Preservation Society, the Nature Conservancy Council and The Vincent Wildlife Trust, with much of the initial training being undertaken by Bob Stebbings and Henry Arnold of the Institute of Terrestrial Ecology.

For those training for a bat licence today, the process then couldn't have been more different: we spent a day having lectures on aspects of bat biology, identification, conservation and licensing and in the evening we

Henry Schofield

The barbastelle, a rare tree roosting bat, has very distinctive echolocation calls allowing it to be identified in the field through bat detector surveys.

each had an opportunity to catch a pipistrelle in a hand net and examine it. After that our licence applications were signed off and participants were urged to form new county Bat Groups. In our case it was the Clwyd Bat Group, but the same process was taking place over much of the rest of Wales. Of course this was not the start of bat work in the Principality – Bob Stebbings and Tom McOwat had been studying the greater horseshoe bat colony at Stackpole; Phil Morgan and John Messenger were active in mid-Wales and John and Molly Hines in the south – but the Bat Project gave the impetus and support that led to the bat conservation movement we have in Wales today.

A spur to recording bats

As well as responding to requests for information from householders and trying to persuade people to keep their bats, the county Bat Groups started to survey the status and distribution of their resident species. For many they were starting from scratch as, beyond occasional references in the annals of long defunct Natural History Societies or the card indexes of local museums, there had been relatively little recording of species. For Wales, with its abundance of natural caves and disused slate and lead mines, the easiest and most productive way of starting to gather this information was to undertake surveys of hibernation sites. Subsequently, many of these surveys have developed into long-term studies and as well as providing useful local information, they have highlighted national changes in bat distribution. In the early 1990s, Montgomeryshire Bat Group reported a greater horseshoe bat hibernating in the West Llangynog Slate mine, even though previous records of the species had been restricted to the southern counties of Wales. Initially it was suspected that this was a single vagrant animal, but over the following winters the species was reported from other underground sites across the border in Clwyd and then from hibernacula as far north as the Conwy Valley. Greater horseshoe bats are now recorded as summer residents in north Wales and it seems only a matter of time before breeding colonies are found in the area.

Serotine bats

Another species that appears to be on the move is the serotine. Serotines are large bats that forage low over grassland feeding on dung beetles. Whereas in Wales we may have boasted of horseshoe bats during the 1980s, if we wanted to see a serotine, we generally had to visit colleagues in south-east England. Unlike the horseshoe bats it is very unusual to find serotines hibernating in underground sites. Although there had been tentative sightings of bats which looked like serotines from south-west Wales, the first substantiated record of the species was in central Powys in 1984, where four animals emerged from the roof space of a large house. One of them was caught and proved to be a juvenile serotine. It was viewed as an extraordinary discovery at the time but over the following decade there were records of individuals caught in mist nets and small colonies discovered in churches and other buildings, mainly in the south of the country. This was at a time when colonies in what was thought to be its stronghold of south-east England appeared to be undergoing a decline. Against this background of increasing evidence of a shift to the west in its range, it was perhaps not unexpected to have the odd one turn up in north Wales in 2011. This might also have been regarded as a vagrant had it not been for the efforts of Sam Dyer and his colleagues, who established, by radio-tracking, the presence of the fifth largest colony in the UK at Llanddulas in north Wales. It's hard to believe that the species would have been overlooked back in the 1980s – they are noisy and make their presence felt in roosts, and they produce copious amounts of very distinctively shaped droppings. They also emerge early at dusk when you can often see them foraging, and they are easy to pick up on a bat detector – but then bat detectors have changed too.

Detection technology

In the mid-1980s the only easily and cheaply available bat detector was made by Queen Mary's College London, which bought in cheap transistor radios and modified them with a transducer microphone so they could detect ultrasound. These were simple heterodyne detectors that you could tune in to different frequencies. Although identifying the two horseshoe bats on these machines was straightforward, the other species, and especially the Myotis bats, were a challenge. We were aided at the time by an audio tape, which guided us through how to separate the different species, so we knew that if we heard a sound like burning stubble, it had to be a Natterer's bat. The early QMC detector was joined in the market by other heterodyne detectors. However, to do any serious sound analysis required a much more expensive detector, a way of recording and playing back the ultrasound (usually a high speed reel-to-reel tape recorder), and a sonograph to analyse the calls, which all cost around £30,000! It was not until the late 1990s that computer technology and electronics had progressed to the point where bat echolocation calls could be recorded in the field and subsequently analysed on a 'home' computer. The development of bat detectors and the means of visualising bat calls continues to this day: it would have been impossible back in the 1980s to imagine a bat detector linked to a mobile phone, which displays sonograms of bat calls to you in the field.

Frank Greenaway

This greater horseshoe bat (top right) was found hibernating amongst lesser horseshoe bats by the author in 1993

The advances in bat detector technology have opened up a whole new way of recording. By visualising calls on a computer screen we can distinguish different call shapes, measure call parameters, and so more accurately identify species than we could using the old bat audio tape. However, the Myotis bats still remain almost impossible to separate from one another and the degree of cross-over in the parameters of noctule, Leisler's bat and serotine make it difficult to be certain about their identity without being able to get a good look at their behaviour in the field. Despite these shortcomings, one species we have been able to detect more easily is the barbastelle. Barbastelles were rarely recorded in Wales during the 1980s and 1990s but they are now known to be widespread here, although they are still regarded as one of our rarest bats.

The new bat detector technology has not only allowed us to look at bat echolocation calls but also their social calls. Bats use these calls to communicate things like territoriality and to attract mates during the breeding season. The calls vary between species and they are often

Henry Schofield

Daubenton's bats – humidity in the tunnel where these were found was so high that water droplets had condensed on their fur.

quite complex and can consist of sharp frequency sweeps and trills. When slowed down so that we can hear them, they are often quite beautiful and sound like bird song. One species that has a highly characteristic social call is the Nathusius' pipistrelle, a long-distance migrant. It seems this is another species 'on the move' – it was never recorded in Britain until the early 1990s, when it started to turn up in small numbers. Although still a rare species in Wales, it is now widely spread and also known to breed here.

New species

Differences in the social calls of pipistrelle bats also pointed towards the fact that our common pipistrelle is actually two distinct species, but the separation was proved using molecular techniques. The pace of advances in genetics and the sequencing technology has been quite staggering. A sample can be processed in a matter of hours and cost as little as a few pounds. Whereas we used to catch bats emerging from roosts to identify species, we can now simply collect their droppings and send them off for analysis. This is how the newest bat species recorded in Wales was discovered. Droppings were collected from a house due for demolition near Milford Haven; no bats were observed in the building, but the laboratory tests confirmed that it had been used by a Grey long-eared bat, one of Britain's rarest species.

The past 30 years has seen some huge changes and, as a result of the activities of our local Bat Groups, our knowledge of the distribution and status of our bats has improved dramatically. We have seen clear changes in the range of some species and new techniques have allowed us to identify new ones. The protective legislation that was enacted in 1981 has helped to secure and protect roosts, and it is gratifying to see many of our bat species doing well and their populations increasing – so much so, that Wales is now home to one of the largest lesser horseshoe bat colonies in western Europe, with 1000 resident bats. However, whilst the threats that loomed large, such as that from toxic remedial timber treatment, have faded into the past, new ones are emerging. Climate change predictions for the country are particularly worrying and threats from ever new tree diseases may threaten our rarer tree bats. Alongside the new threats will come more advances in technology and survey techniques; we can look forward to GPS tags that are small enough to fit to our resident bats, and maybe hand-held portable devices for confirming species identification using molecular techniques. It seems likely the next 30 years will be as challenging and changeable as the past have been.

__Dr Henry Schofield__ is the Conservation Programme Manager for The Vincent Wildlife Trust.

Ystlumod yng Nghymru

Mae ystlumod yn y DU wedi'u gwarchod ers 1981, blwyddyn lle gwelwyd grwpiau ystlumod newydd yng Nghymru a oedd yn benderfynol o ddysgu mwy am ddosbarthiad ystlumod a darbwyllo perchnogion tai i ofalu am eu hystlumod. Ers hynny mae llawer o arolygon wedi'u cynnal ar safleoedd gaeafgysgu mewn ogofâu a hen fwyngloddiau, a daethpwyd o hyd i amrywiaeth eang o rywogaethau. Mae ambell rywogaeth, a oedd yn hysbys yn Lloegr yn unig cyn hyn, yn ymddangos yn rheolaidd yng Nghymru bellach. Mae technoleg o'r radd flaenaf wedi dweud mwy wrthym nag y gallem obeithio amdano 30 mlynedd yn ôl, gan adnabod galwadau'r gwahanol rywogaethau. Yn y dyfodol, y gobaith yw y bydd tagiau GPS yn ddigon bach i'w rhoi ar ystlumod.

All photographs: Lin Baldock or Liz Morris © Natural Resources Wales

A dense bed of quillwort *Isoetes lacustris* (Gwair merllyn) growing in the very clear waters of Llyn Cregennen Isaf. This relative of ferns is a common plant in nutrient-poor lakes, but beds often become overgrown by algae in summer

Llynnau Cregennen -

the hidden jewels of Cadair Idris

Acid rain, pollution, peat erosion, nutrient enrichment, invasive non-native species – life is tough for freshwater lakes in Wales, and few manage to maintain healthy ecosystems which meet European targets. What a delight, therefore, to find thriving lakes which appear to have changed little over the centuries. ***TRISTAN HATTON-ELLIS*** *headed a team which plunged into an investigation and emerged with an astonishing insight into underwater life.*

Ten years ago, a colleague and I stopped at Llyn Cregennen Isaf on the northern slopes of Cadair Idris on a brief reconnaissance. We were on our way back from a meeting in Aberystwyth and I was tired. I had a brief explore round the shores of the lake, but they were barren, exposed and wave-washed. There were few plant remains and these were the typical species you can see in any half-decent Welsh upland lake – quillwort *Isoetes spp*., shoreweed *Littorella uniflora* and water lobelia *Lobelia dortmanna*. We went home and I thought no more about it.

Recently, I was chatting with botanist colleague Andy Jones, who is one of those people who instinctively knows where to look for good habitats. We got talking about large broad-leaved pondweeds, a group of plants that have declined severely in southern Britain. He suggested I try Llynnau Cregennen.

It seemed unlikely. In general, broad-leaved pondweeds are not upland

Delicate stonewort *Chara virgata*

plants. They have tall stems and large, laminar leaves that are vulnerable to wind exposure. Moreover, they need some calcium in the water, which is in short supply in the acid Welsh uplands. Nevertheless, we decided to take a second look. In 2012 the then Countryside Council for Wales (now Natural Resources Wales) commissioned a survey to take a closer look at the ecology of Llynnau Cregennen. What we found was astonishing. To understand why, it's worth first looking at the overall status of lakes in Wales.

The status of lakes in Wales

There are about 550 lakes (that is, water bodies more than 1 hectare in area) in Wales. Many are natural in origin; these tend to be concentrated in North Wales, especially in Snowdonia and Anglesey. Some have since been modified for use as water supply reservoirs, and further south most lakes have been created for this purpose.

Lake ecosystems suffer from various pressures. Upland lakes are naturally rather species-poor, and many have been affected by acid rain and peat erosion. Lowland lakes, by contrast, are generally well-buffered and more diverse but have been seriously affected by eutrophication (nutrient pollution), which causes loss of species, deoxygenation and algal blooms. Invasive species can also be a major problem, displacing native plants and animals and causing irreversible changes to the ecosystem. Few lakes in either uplands or lowlands meet their environmental objectives, and it is very unusual to find a lake that can be considered to have a fully healthy ecosystem.

Different lake types have different ecological targets depending on their natural conditions. There is a bewildering range of types and typologies, but the most important one is probably that identified in Annex I of the Habitats Directive[1]. In Wales, the three main types are:

- Nutrient-poor, acidic to neutral lakes with *Littorelletea* vegetation (short, wave-tolerant, tufted plants such as shoreweed, quillwort *Isoetes lacustris* and water lobelia).
- Hard water, nutrient-poor lakes with *Chara* (stoneworts). This habitat is normally dominated by large stonewort meadows.
- Naturally nutrient-rich lakes with *Magnopotamion* vegetation (*Magnopotamion* are large, perennial pondweeds with creeping rhizomes and translucent submerged leaves, such as perfoliate pondweed *Potamogeton perfoliatus*).

Although the types do overlap, there is normally no great difficulty in assigning a Welsh lake to one of these types. Upland lakes almost always fit into the oligotrophic *Littorelletea* type; lowland lakes into the *Magnopotamion* type; and lakes on limestone into the *Chara* type. However, undamaged examples of the latter two types are rare in Britain and unknown

Cristatella mucedo is a freshwater bryozoan, a colony of zooids that filter-feed using small tentacle crowns. In winter the colonies break down into many seed-like resting bodies (statoblasts), enabling them to disperse between water bodies; the golden dot is a developing statoblast.

in Wales. In the UK's last Habitats Directive reporting round to the European Commission, the status of *Littorelletea* lakes was assessed as 'Unfavourable - Inadequate' and that of the other two lake habitats as 'Unfavourable – Bad'[2]. For conservationists, it is a depressingly familiar picture.

Monitoring lakes

The standard UK nature conservation survey method for lake monitoring is known as Common Standards Monitoring (CSM)[3], and is used by all of the UK conservation agencies for monitoring protected sites. The approach applies to any lake, and consists of a structured plant survey using four transects from shallow to deep water, using a combination of waders, a boat, glass-bottomed bucket and, where necessary, a double-headed rake. At least four water samples are collected and analysed for key measures of water quality (Table 1). A dissolved oxygen / temperature profile and Secchi depth reading (see Box) are taken from the deepest point in the lake. Together with other information collected during fieldwork, and where available other data, this is compiled into a condition assessment – a sort of ecological health check of the lake.

Secchi depth

Water clarity is a critical factor for aquatic plants. Clear water allows light to penetrate deeper in the water column; in turn this means that plants can grow in a greater proportion of the lake. Increased turbidity is usually caused by peat staining the water column, phytoplankton, or suspended sediment. Freshwater biologists measure transparency using the Secchi depth, so called after the Italian admiral who invented the technique. A black and white Secchi disc attached to a tape measure is slowly lowered into the water column. The point at which the disk is no longer visible is termed the Secchi depth. Larger depths indicate greater water transparency.

We can also gain insights into the environmental history of lakes using a technique called palaeolimnology. This method exploits the fact that sediment slowly accumulates at the bottom of lakes, along with the remains of the animals and plants that lived there. By identifying and counting these remains, scientists can reconstruct past environmental conditions. A particularly informative group are diatoms, microscopic algae with siliceous cell walls that preserve well in sediments. By studying the fossil-diatom flora in radiometrically dated lake sediments, it is possible to estimate the pH and phosphorus concentrations in a lake decades or even centuries ago, and to link observed changes to historic events or data. Other remains from zooplankton, plants and even fish scales are also used to add further insight into past species assemblages and habitats.

The Llynnau Cregennen survey

In 2012, ENSIS Ltd, a consultancy based at University College London, carried out a CSM and palaeolimnological survey of Llynnau Cregennen[4] as part of CCW's Biodiversity Action Plan survey work.

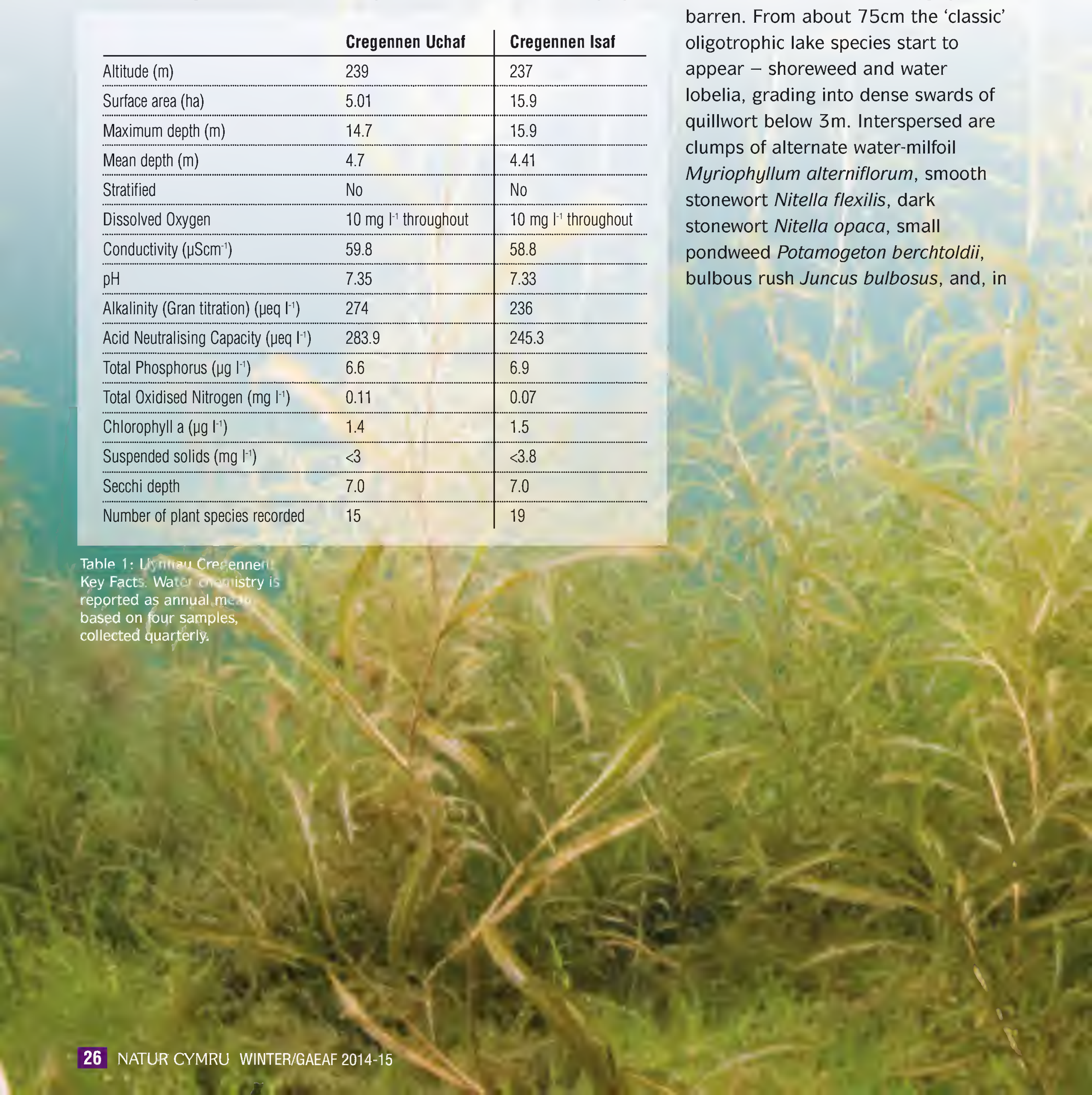
Lesser bladderwort *Utricularia minor* (Chwysigenddail bach), whose carnivorous bladders trap waterfleas.

Water quality was excellent. Both lakes were crystal clear and had naturally low nutrient levels, moderate alkalinity (just above neutral pH) and were very well oxygenated (Table 1). Physical habitat was also very good. Nineteen aquatic plant species were found, all of which were native, most of which rely on good water quality, and some of which are locally or nationally rare. Subsequently, NRW commissioned Marine Ecological Solutions to carry out a dive survey of the lakes as part of a separate project, and this generated the photographs that accompany this article.

Both lakes are shallow, with a small 'hole' of deeper water. They divide into several distinct zones. In the littoral zone (less than about 75cm), the shores are coarse, loose gravel with finer sediment winnowed away by fierce wave action. This zone is largely barren. From about 75cm the 'classic' oligotrophic lake species start to appear – shoreweed and water lobelia, grading into dense swards of quillwort below 3m. Interspersed are clumps of alternate water-milfoil *Myriophyllum alterniflorum*, smooth stonewort *Nitella flexilis*, dark stonewort *Nitella opaca*, small pondweed *Potamogeton berchtoldii*, bulbous rush *Juncus bulbosus*, and, in

	Cregennen Uchaf	Cregennen Isaf
Altitude (m)	239	237
Surface area (ha)	5.01	15.9
Maximum depth (m)	14.7	15.9
Mean depth (m)	4.7	4.41
Stratified	No	No
Dissolved Oxygen	10 mg l^{-1} throughout	10 mg l^{-1} throughout
Conductivity (µScm^{-1})	59.8	58.8
pH	7.35	7.33
Alkalinity (Gran titration) (µeq l^{-1})	274	236
Acid Neutralising Capacity (µeq l^{-1})	283.9	245.3
Total Phosphorus (µg l^{-1})	6.6	6.9
Total Oxidised Nitrogen (mg l^{-1})	0.11	0.07
Chlorophyll a (µg l^{-1})	1.4	1.5
Suspended solids (mg l^{-1})	<3	<3.8
Secchi depth	7.0	7.0
Number of plant species recorded	15	19

Table 1: Llynnau Cregennen: Key Facts. Water chemistry is reported as annual mean based on four samples, collected quarterly.



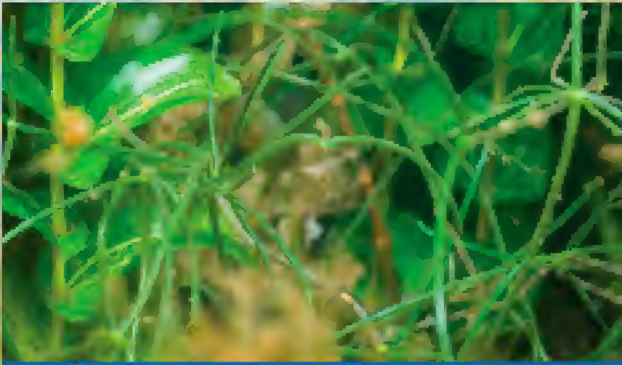
more sheltered areas, beds of broad-leaved pondweed, *Potamogeton natans*. Lesser bladderwort *Utricularia minor* is also common in this zone. Nutrients garnered from luckless waterfleas trapped in its carnivorous bladders supplement low concentrations in the water column.

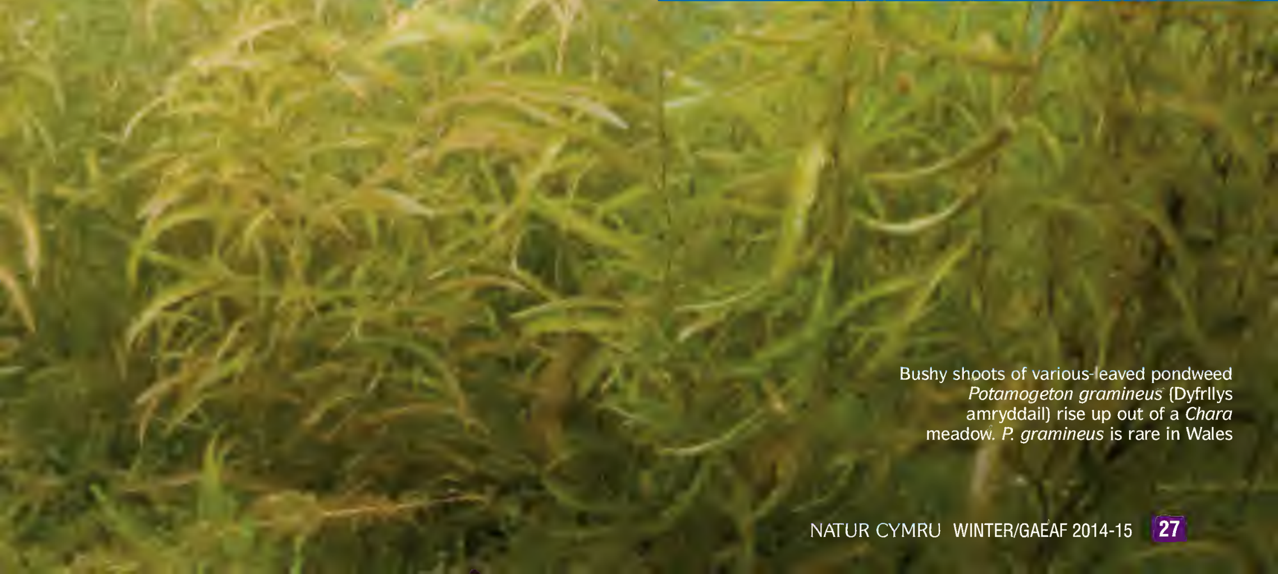
Thus far, this is a fairly typical (if species-rich) *Littorelletea* flora. But by around 1m depth occasional plants of delicate stonewort *Chara virgata* poke up between the quillworts. By 4.5m the quillworts are replaced by dense stonewort meadows. And, mainly on the leeward side of the lakes, broad-leaved pondweeds rise in translucent, kelp-like forests.

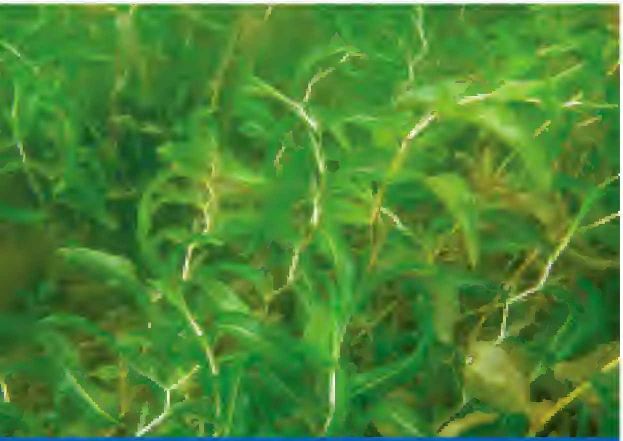
Broad-leaved pondweeds

Three broad-leaved pondweeds grow in the lakes. The most abundant is perfoliate pondweed, which grows in rivers and lakes, especially in deeper water, and is more nutrient-tolerant than most other species. It is fairly widespread in Wales, though rarely abundant, often clinging on in small, algal-covered patches in generally unsuitable habitat. In Llynnau Cregennen it is a handsome dark green with contrasting white veins, clean of filamentous algae (see page 2).

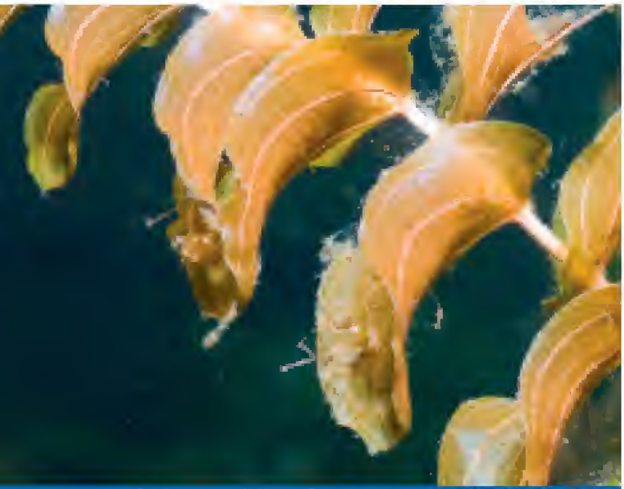
A real rarity is long-stalked pondweed, *Potamogeton praelongus*. One of the largest pondweeds in the UK, the 3m stems have a characteristic zig-zag pattern and beech-green leaves up to 30cm long. It needs unpolluted, deep, neutral to alkaline water low in nutrients, and rarely grows in less than 1m of water. Long-stalked pondweed is Near Threatened at a GB level, and Critically Endangered in Wales, but forms substantial beds in Llynnau Cregennen. Although it has been recorded in 1881, 1969 and 2012, this is the first survey that can accurately estimate its extent in the lakes.


Translucent stonewort *Nitella translucens*


Bushy shoots of various-leaved pondweed *Potamogeton gramineus* (Dyfrllys amryddail) rise up out of a *Chara* meadow. *P. gramineus* is rare in Wales



Verdant bed of long-stalked pondweed *Potamogeton praelongus* (Dyfrllys hirgoes), one of the rarest aquatic plants in Wales



Hydras are freshwater relatives of sea anemones, and capture their prey using stinging cells. This is *Hydra oligactis*, a lake specialist.

The other broad-leaved pondweed is various-leaved pondweed, *Potamogeton gramineus*. This plant has relatively narrow, olive-green to brownish, translucent submerged leaves, and may produce a smattering of floating leaves. It needs clean, neutral to alkaline water in lakes, slow-flowing rivers, ditches and ponds and is another Welsh rarity, occurring in only six small, scattered populations. As in all of its Welsh locations, various-leaved pondweed is uncommon in Llynnau Cregennen.

By around 6m depth the lake bed is entirely covered by charophytes. In the deepest vegetated zone, around 8m, there are only patches of fragile stonewort and ghostly tangled beds of translucent stonewort *Nitella translucens*.

This extraordinary flora is outstanding in the UK and has very few analogues. It contains elements of all three of the principal Habitats Directive vegetation types – dense *Littorelletea* flora in the shallows; swards of *Chara*, and substantial beds of broad-leaved *Potamogeton* (possibly the largest such beds in Wales).

Palaeolimnology reveals that the lake has hardly changed over the centuries. Sedimentation is extremely slow. Radiometric dating showed that the top 8cm of sediment represents a period of approximately 150 years. This slow rate of sedimentation reflects the lack of an inflow stream from the catchment and the relatively natural surrounding land use, which means there are no siltation problems. Diatom remains likewise show only minimal species changes and suggest that both lakes have had stable pH and nutrient levels for hundreds of years.

Although we have a good understanding of the plant community, diatoms and water quality of the lakes, there are gaps. We know almost nothing about the benthic or planktonic invertebrate communities, for example, or the phytoplankton. It is possible that other rare species await.

Conclusions

Llynnau Cregennen are of great conservation and scientific importance. Their high levels of naturalness and environmental quality, presence of rare species, and rare combinations of communities makes them a unique conservation resource and, by most criteria, almost certainly the best lakes in Wales. They underline just how little we still know about what lies beneath the surface of our lakes. And of course their clean, clear water and stunning setting also makes them extremely beautiful.

Scientifically, Llynnau Cregennen help us to understand how pristine lakes in Wales work. Most lakes have been affected by different pressures, so studies rely on using unimpacted reference sites that act as a natural control. Unfortunately, these reference sites may differ from impacted sites in ways that are not related to the pressure. For example, while we may wish to use lakes in northern Scotland as reference sites for Welsh lakes, there are climatic and ecological differences between Scottish and Welsh lakes that weaken such comparisons. Llynnau Cregennen therefore provide a benchmark against which to compare other Welsh lakes, and are potentially a valuable site to study climate change in the absence of other pressures.

Llynnau Cregennen are a great rarity in Wales – two lakes that can genuinely be said to be ecologically healthy. Of course, this doesn't mean that they are totally untouched by man. Both lakes are managed as a trout fishery by the local farm. The lakes are owned by the National Trust, which manages a nearby car park and toilet block. However, there is no hint of damage to these unique ecosystems. It is to be hoped that the current sustainable management can be maintained to safeguard these precious and fragile ecosystems for the future.

Llynnau Cregennen

Mae popeth, fwy neu lai, o law asid i ddiocsigenu a rhywogaethau estron goresgynnol, yn effeithio ar ecosystemau llynnoedd yng Nghymru; ond mae Llynnau Cregennen ar lethrau Cadair Idris o bwysigrwydd cadwraethol a gwyddonol mawr. Dengys arolygon tanddwr a gynhaliwyd yn ddiweddar eu bod yn naturiol iawn, bod ansawdd yr amgylchedd yno'n dda, a bod yno gyfuniad prin o gymunedau, a rhywogaethau prin. Un o'r rhai prinnaf yw'r dyfrllys hirgoes Potamogeton praelongus, sydd angen dŵr dwfn heb ei lygru. Mae hwn yn tyfu hyd at 3m o uchder ac mae ganddo ddail 30cm o hyd. Mae'r gwaddodi'n araf iawn; ac yn ôl profion a gynhaliwyd, prin fod y llynnoedd wedi newid dros y canrifoedd. Ymddengys nad yw'r llynnoedd wedi'u niweidio, er iddynt gael eu rheoli fel pysgodfa frithyll, a'r gobaith yw y byddant yn parhau i fod felly ymhell i'r dyfodol.

Acknowledgments
I would like to thank Ben Goldsmith and Stewart Clarke for their comments. Thanks to the National Trust for providing access for surveys, without which none of this would have been possible. Surveys and scientific work were carried out by ENSIS Ltd at University College London. Liz Morris and colleagues at Marine Ecological Solutions organised the underwater photography.

__Tristan Hatton-Ellis__ is a freshwater scientist, now at Natural Resources Wales after 15 years at the Countryside Council for Wales. He was particularly pleased to encounter the freshwater bryozoan Cristatella mucedo *in Llynnau Cregennen, having studied its population genetics for his PhD!*

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Lowri Roberts

Tro'r tymhorau ar hyd ein glannau

Pwll glan môr
Rockpool

*Mae **NIA HAF JONES** yn ein tywys ni drwy'r newidiadau a welir o dymor i dymor ar lan y môr ac o dan y tonnau, ac yn rhannu ambell berl o wybodaeth am rai o'n rhywogaethau arfordirol.*

Lowri Roberts

Gwichiad cyffredin
Littorina littorea
Common winkle

Lleolir Prydain mewn ardal o drawsnewid arwyddocaol o ran bio-ddaearyddiaeth. I'r gogledd-ddwyrain ceir rhywogaethau dyfroedd oer (boreo-arctig) ac i'r de-orllewin gwelir rhywogaethau dyfroedd cynnes (Lwsitanaidd) oherwydd effaith cynhesu Drifft Gogledd yr Iwerydd. Oherwydd hyn, ac o ystyried hefyd yr amrywiaeth helaeth o gynefinoedd sydd i'w cael o gwmpas ein glannau, o draethellau llaid i glogwyni creigiog garw, mae bio-amrywiaeth forol Prydain yn hynod o gyfoethog. Yn ddiddorol, o safbwynt dosbarthiad rhai rhywogaethau, mae'r llinell derfyn a ddisgrifiwyd fel y "General Limit of Southern Types" gan Edward Forbes yn 1858, yn rhedeg yn syth drwy ganol ardal arfordirol Sir Conwy. Er bod 150 a mwy o flynyddoedd wedi mynd heibio ers i fap Forbes gael ei argraffu am y tro cyntaf, mae llawer iawn ohono'n dal i fod yn gywir hyd heddiw. Gallu rhywogaethau i oroesi ac atgynhyrchu o fewn amrediad tymheredd y môr yw'r prif ffactor sy'n penderfynu eu dosbarthiad.

Mae rhywogaethau morol yn byw o fewn amrediad tymheredd llawer mwy cyfyngedig na rhywogaethau dŵr croyw gan fod tymheredd y môr ar y cyfan yn sefydlog ac yn newid yn araf iawn. Stori wahanol sydd yn y parth rhynglanw lle caiff rhywogaethau eu herio gan eithafion amgylcheddol wrth iddynt ddod i gyswllt gyda'r awyr agored. Wrth i dymheredd y môr newid, o ganlyniad i newid yn yr hinsawdd, fe welwn newidiadau yn y dosbarthiad bio-ddaearyddol hwn gyda rhai rhywogaethau gogleddol eisoes yn cilio a rhai eraill, mwy deheuol, yn ymledu.

Fel gwlad sy'n gorwedd ar ledred tymherus ceir newidiadau mewn tymheredd a thywydd o dymor i dymor yma yng Nghymru, ac yn yr un modd gwelir hefyd newidiadau tymhorol yn nosbarthiad a phresenoldeb rhywogaethau morol. Ar y tir, hawdd yw gweld a theimlo'r newidiadau arwyddocaol sy'n digwydd wrth i'r tymhorau droi, ac er efallai bod rhai arwyddion amlwg ar hyd y glannau – fel mewnfudiad adar y môr a blodeuo llystyfiant yr arfordir – mae hi'n dipyn anoddach i sylwi ar yr hyn sy'n digwydd o dan y tonnau oddi ar ein harfordiroedd.

Felly beth am gael cipolwg ar y flwyddyn ar hyd yr arfordir ac o dan y don...

Yn nŵr y môr

Gyda'i wraidd yn yr enw Groegaidd *planktos* (ei ystyr yw 'crwydryn') mae gan ddosbarthiad plancton, yn enwedig y ffytoplancton, batrwm tymhorol. Gan fod plancton yn sail i'r gadwyn fwyd forol caiff hyn effaith sylweddol ar ddosbarthiad bywyd arall y môr. Gellir rhannu plancton, yn fras, yn ddau fath – sef y diatomau a'r dinofflangellion. Ar ddechrau'r flwyddyn, pan nad oes llawer o oleuni ac wedi i'r stormydd gaeafol gorddi'r dyfroedd, 'does fawr ddim ffytoplancton yn y dŵr. Yn gynnar yn y gwanwyn wrth i'r dyddiau ymestyn gwelir cynnydd yng nghynhyrchiant y diatomau ac mae thermoclein yn dechrau datblygu. Dyma ffyniant plancton cyntaf y flwyddyn. Wrth i'r gwanwyn fynd yn ei flaen mae'r silica sy'n angenrheidiol i dwf diatomau yn prinhau, ac mae hyn yn rhoi'r cyfle i'r dinofflangellion gynyddu. Erbyn yr haf mae'r thermoclein wedi sefydlu a'r dinofflangellion sy'n trechu o ran y plancton gan eu bod yn gallu ymdopi gyda lefelau isel o faeth. Wrth i wyntoedd cryf yr hydref gorddi'r dyfroedd mae'r thermoclein yn dadfeilio, ac os yw'r amodau'n caniatáu gall maetholion gael eu tynnu o'r dyfroedd gan achosi ail ffyniant o ddinofflangellion.

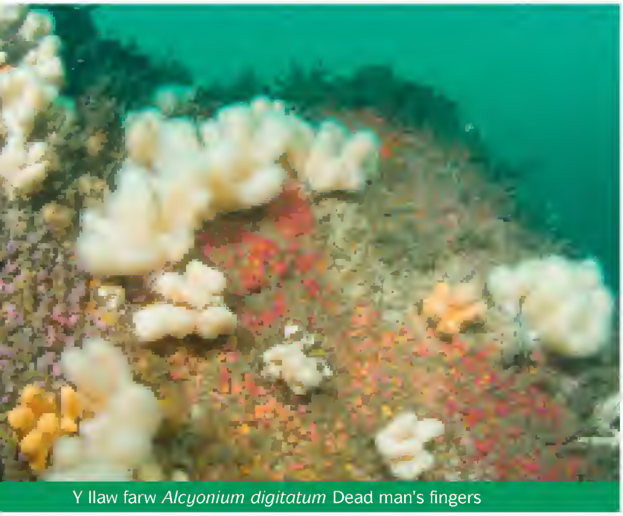
Lowri Roberts

Môr-wlithen glustiog yn cnoi letys môr
Sea hare munching on sea lettuce

Dan Burton

Heulforgi *Cetorhinus maximus* Basking shark

Ar ben y cynnydd mewn ffytoplancton yn y gwanwyn gwelwn hefyd gynnydd mewn söoplancton. Mae nifer o rywogaethau morol yn atgynhyrchu ac yn rhyddhau eu hwyau i ddŵr y môr yn y gwanwyn i gydfynd â ffyniant y ffytoplancton, ac felly mae'r meroplancton (söoplancton sy'n treulio dim ond rhan o'u bywyd fel plancton) yn eang eu dosbarthiad ar yr adeg hon o'r flwyddyn. Gyda hyn y mae'r holoplancton (söoplancton sy'n treulio eu holl fywyd yn y plancton) hefyd yn ffynnu. Golyga hyn fod bwyd yn doreithiog yn y môr yn ystod y gwanwyn a'r haf, ac o ganlyniad fe welwn nifer o rywogaethau sy'n ymfudo, megis heulforgwn a


Rohan Holt

Y llaw farw *Alcyonium digitatum* Dead man's fingers

physgod eraill, yn cyrraedd ein dyfroedd. Dyma'r rheswm hefyd pam y daw'r adar yr ydym mor gyfarwydd â nhw i nythu ar glogwyni ein harfordir.

Ar y lan ac yn y dyfroedd bas

Mae newidiadau hefyd yn digwydd ar lan y môr lle mae'r amgylchiadau amgylcheddol yn llawer mwy cyfnewidiol. Yn agored i wyntoedd rhewllyd y gaeaf ac i heulwen poeth yr haf, mae bywyd yn y parth rhynglanw yn un caled.

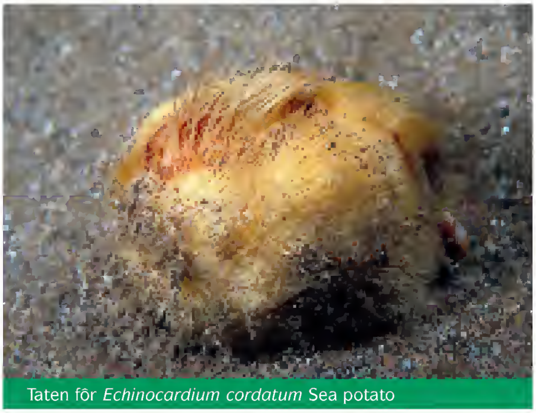
Mewn tymor arferol gall nifer o rywogaethau ar lan y môr ymdopi'n llwyddiannus â'r cyflyrau anodd hyn. Mae hyn yn arbennig o wir am rywogaethau sy'n methu symud am eu bod yn anifeiliaid digoes. Ond i'r rhain gall gaeaf sy'n anarferol o eithafol fod yn ddinistriol iawn. Mae'r rhywogaethau sy'n medru symud yn mudo i lawr y lan wrth iddi oeri, ac i ddyfroedd dyfnach lle mae tymheredd y dŵr yn llawer mwy sefydlog. Gwelir symudiad blynyddol o bysgod pyllau trai, megis llyfrothod a gobïod, ac mae hyn hefyd yn wir am nifer o rywogaethau o gramenogion megis corgimychiaid a chrancod. Gall rhai rhywogaethau, megis y gwichiad *Littorina littorea*, droi'n swrth ac anweithgar yn ystod gaeafau a rholio i lawr y lan gyda'r llanw i ddŵr cynhesach.

Yn nyfroedd bas y môr mae'r hydref, i rywogaethau fel y llaw farw *Alcyonium digitatum*, yn amser i gilio am y gaeaf. Math o gwrel meddal yw'r llaw farw gyda channoedd o bolypau yn rhannu sgerbwd meddal (y 'bysedd'). Pan yn bwydo yn ystod misoedd y gwanwyn a'r haf mae'r polypau hyn yn ymddangos ar y wyneb gan greu golwg flewog ar y cwrel. Yn ystod yr hydref mae'r polypau'n ymneilltuo am fisoedd. Erbyn y gwanwyn byddant wedi cael gwared o'r croen allanol ac ail-gychwyn bwydo.

Mae arwyddion o fywyd newydd i'w gweld yn y pyllau trai yn y gwanwyn. Mi fydd y gwymon blynyddol yn dechrau ymddangos tra bod y mathau lluosflwydd yn cychwyn eu twf tymhorol. Gwelir hefyd rhai o'r creaduriaid mwy rhyfedd yr olwg, megis y fôr-wlithen glustiog *Aplysia punctata*, yn y pyllau trai. Mae'r rhywogaeth hon wedi ei henwi oherwydd y tentaclau clustiog ar y pen. Daw'r gwlithod i'r dyfroedd rhynglanw i ffurfio cadwyni paru, a chan ei bod yn rhywogaeth ddeurryw, gall unigolion weithredu fel gwryw a benyw yn y cadwyni. Mae eu wyau yn ffurfio llinynnau pinc hir sydd i'w gweld mewn pyllau trai ar adeg trai.

Rohan Holt

Gwymon yn Rhoscolyn • Seaweed at Rhoscolyn


Paul Naylor

Taten fôr *Echinocardium cordatum* Sea potato

Ar y traeth

Mae arwyddion newid tymhorau i'w gweld ar y traeth hefyd. Er bod llawer o'r rhain i'w gweld drwy'r flwyddyn, y gaeaf yw'r amser gorau i chwilota am rhywogaethau dieithr sy'n cael eu bwrw i'r lan gan wyntoedd cryfion.

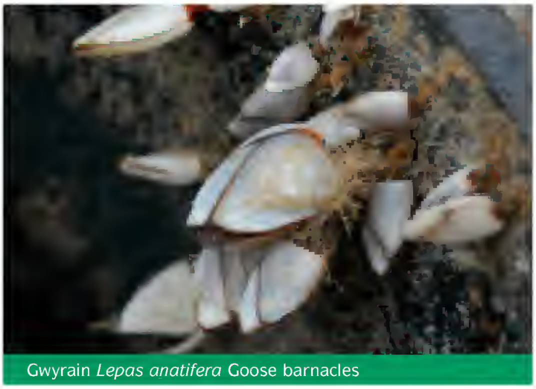
Mae'n werth edrych am y gwyran, *Lepas anatifera*, sydd i'w ganfod yn aml ar lannau Cymru ar ôl stormydd a gwyntoedd cryfion y gogledd-orllewin. Cartref naturiol y gwyran yw'r broc sy'n arnofio yn nŵr y môr agored ac yn darparu man angori iddynt dyfu. Yn hanesyddol ar froc môr naturiol megis coed a phren y gwelwyd cregyn gwyran, ond gan amlaf y dyddiau hyn, yn anffodus, mae'n tyfu'n fwy-fwy ar wrthrychau plastig hefyd. Mae eu cregyn tryloyw, y cambwl, wedi ei ffurfio o sawl plât ar ben coesyn hir. Oherwydd eu tebygrwydd i'r ŵydd wyran, *Branta leucopsis*, a'r ffaith nad oedd neb erioed wedi gweld eu hwyau roedd cred ar un adeg mai gwyddau ifanc oedd y gwyrain (nid oedd pobl yn gwybod bod adar yn ymfudo i nythu yr adeg honno). Yn ei ddisgrifiad 1188 o dirlun a phobl Iwerddon nododd Gerallt Gymro bod y gŵydd yn datblygu "gan grogi gerfydd eu pigau" ar froc môr ac yn hedfan i ffwrdd ar ôl cael eu maeth oddi wrth "suddau'r pren a dŵr môr". Oherwydd y gred hon credai pobl nad oedd yr ŵydd wyran wedi ei geni o gnawd ac felly roedd modd eu bwyta ar ddiwrnodau pan fyddai bwyta cig wedi ei wahardd am resymau crefyddol.

I liniaru tymheredd eithafol, un ai oerfel neu wres, mae rhywogaethau sy'n turio yn tyllu'n ddyfnach i mewn i'r tywod a'r llaid. Yma mae'r tymheredd yn fwy sefydlog. Ar ôl stormydd enbyd, fel y rhai a welwyd y gaeaf diwethaf, mae nifer fawr o'r creaduriaid hyn yn cael eu taflu i'r lan. Ac er gwaethaf eu gallu i durio, gall y dyfroedd gwyllt gorddi'r llaid i'r fath raddau nes bod rhywogaethau megis y gwelchyn *Echinocardium cordatum* a chwerwddwr y môr *Thyone fusus* yn cael eu golch i fyny yn eu miloedd.

Wrth i wyntoedd cryf y gaeaf gilio mae llai i'w weld ar lan y môr, ond arwydd sicr o ddyfodiad yr haf yw'r cynnydd yn niferoedd argregyn gweigion y cranc heglog pigog *Maja squinado*. Yn ystod misoedd yr haf dont at ei gilydd yn eu degau i fwrw eu hargregyn mewn twmpathau. Wrth wneud hyn mae'r crancod yn cadw'n ddiogel tra bod eu cregyn yn feddal, a dim ond ar yr adeg hon y mae'r benywod yn fodlon derbyn gwrywod.

Yn wir, mae digonedd i'w weld wrth i'r tymhorau newid ar y tir, ond y tro nesaf y byddwch yn sylwi ar y wennol yn cyrraedd neu'r dail yn disgyn, trowch eich meddwl at lan y môr a'r newidiadau sy'n digwydd o dan y don.

*Mae **Nia Haf Jones** yn Swyddog Morol gydag Ymddiriedolaeth Natur Gogledd Cymru. Ei nod yw annog a galluogi plant (o bob oedran!) i ymuno â hi i ddarganfod rhyfeddodau moroedd Cymru. 01248 351541 / 07855454132 niajones@wildlifetrustswales.org*


Jonny Easter

Gwyrain *Lepas anatifera* Goose barnacles

Seasonal seas

The coast of Wales is affected by both warm and cold waters due to the influence of the North Atlantic Drift, making it a challenging place for species to live. The temperature underwater remains relatively stable, but the intertidal area has to cope with extremes of submersion, exposure to air, and all the vagaries of seasons and weather. Species adapt either by moving geographically (north and south) or physically (burying deeper into the mud, for example). Seasonal patterns and changes are not as obvious as they are on land, but they are there if you know what to look for. Spring sees new growth of plants and breeding of species, just as it does on land.

A full translation of this article is available on request.

Citizen scientists counting our breeding birds

Our breeding land-birds are probably the best monitored in the world. **GEOFF GIBBS** *explains how it is done, which species are the winners and which the losers, and what the fieldworkers get out of taking part.*

John Bridges (RSPB -images.com)

Goldcrest *Regulus regulus* Dryw eurben

Amateur birdwatchers (birders) have been counting the breeding birds of Wales for many years, using methods developed by the British Trust for Ornithology (BTO). The current method adopted is the Breeding Bird Survey (BBS), which began in 1994 and has now produced 20 years of published data[1]. Initially it ran in parallel with the Common Birds Census (CBC) until the latter was phased out in 2000. The annual counts provide information about the more widely distributed breeding birds; other surveys cover colonial species such as seabirds and herons, and crepuscular birds like nightjars and owls.

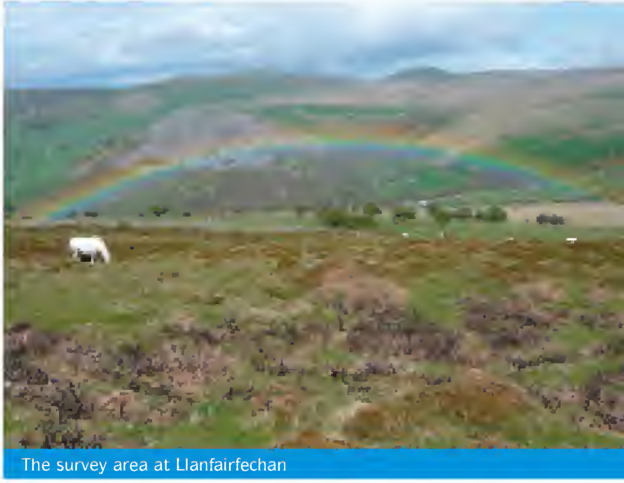
Annual population counts actually started with the CBC in 1961. CBC observers could choose where they did their counts, in habitats which could be classified broadly as farmland or woodland. Other habitats such as built-up areas were excluded, which meant that little useful information was obtained about birds like house sparrows (this didn't matter until they were seen to be declining!). Introduction of the BBS in 1994 was rather a culture shock for BTO members and volunteers – they had to choose their recording area from a list of 1km x 1km squares generated by a computer. Allocation of these to observers was in the hands of the BTO Regional Representative (Regional Rep), who often had to explain that 'No, you can't choose a square close to your home (unless there is one on the list), nor can you move it to what might be a more interesting square next door!' Once the square is chosen, the observer walks along two parallel 1km transects in the square, counting all birds seen or heard (including those flying over). Habitat information along the transect lines is also collected - not an onerous task in North Wales squares as the habitat hardly changes from year to year. After two visits in the breeding season, the counts and habitat information are sent to the BTO or entered directly online.

A personal experience of BBS surveying in Wales

Since returning to North Wales in 2001, I have surveyed four different BBS squares, starting with a sheep pasture valley and hillside above Conwy (averaging 38 species over two visits), moving on to a lowland village set in farmland near Caernarfon (averaging 30 species including good numbers of house sparrows, starlings and jackdaws). As I walked through the village of Bethel, I was counting birds which in the past were widespread breeding birds but which have now declined greatly in many parts of Britain. Since 2012 my allocation is two adjoining upland squares above my home in Llanfairfechan, which I cover on the same morning. The first includes a valley with scrub and a stream (around 26 species, often including reed bunting and cuckoo); from here I walk into unimproved upland grass, gorse and heather with only around 13 species. Meadow pipits are the most numerous, but there are also skylark, ring ouzel, linnet, whinchat, stonechat and wheatear to record. The BBS instructions require that the survey should be done in good weather (not too windy or wet), so it is normally a really pleasurable experience.

Observers – numbers and skill level

- The number of squares being surveyed in Wales has increased from 122 in 1994 to 331 in 2013. There was a reduction in 2001 due to access restrictions during Foot and Mouth, and a slight fall-off during the Atlas years of 2008-11. Availability of training and mentoring after the BTO Cymru office opened in 2012 facilitated the big jump to the 2013 total.
- How competent do the observers need to be? This is quite a tricky question. It partly depends on how many species are likely to be present. Upland squares may only hold pipits, carrion crows, perhaps wheatears and fly-over ravens, where a beginner would be a perfectly adequate surveyor. Realistically, the main problem is finding somebody willing to take it on at all! In a different square with woodland, scrub and perhaps a stream, there may be ten or more woodland species, singing but difficult to see, which must be counted. Once the trees are in leaf, there just isn't time to wait until each individual can be seen, so a reasonable knowledge of songs and calls is necessary. On the other hand, the Regional Rep doesn't want to turn a volunteer away, and an enthusiastic learner can turn into a really competent observer in a few years.



Geoff Gibbs

The survey area at Llanfairfechan

- Can anno domini be a difficulty? We are constantly being told that few youngsters are being recruited, and so field workers are getting older. This can be a problem with birds like goldcrests which are usually picked up by song or call; as our hearing acuity diminishes with age, some species might be falling off the radar.

Population trends in Wales

The rise in the number of recorded squares has allowed the development of population trends for the more widely distributed species in Wales – those recorded on an average of at least 30 squares per year. For these calculations, the higher count from the two visits for each species is used, from all squares surveyed for at least two years. The trend figures are stated as percentage increases or decreases over 1995-2012.

John Harding

Goldfinch *Carduelis carduelis* Nico

Allan Drewitt

Starling *Sturnus vulgaris* Drudwen

There are of course winners and losers, the biggest winners being as follows:
- great spotted woodpecker +193%
- blackcap +124%
- house sparrow +96%
- goldfinch +80%

with the biggest losers being:
- starling -70%
- yellowhammer -59%
- curlew -56%
- goldcrest -52%

Further information on trends for these and other species in Wales (and the UK generally) can be found in Harris et al. 2014.

In addition to the population changes monitored by the BBS, there is another major indicator of change – the information in the breeding season Atlases, carried out at 20-year intervals since 1968-72. The main aim has been to map the distribution of the breeding birds of Britain and Ireland on a 10x10km grid. The results of the latest Atlas were published in 2013[2]. Maps show how the distribution of each species has changed during the 40 years since 1968-72. A good example showing range change is provided by the Atlas maps for great spotted woodpecker, which show that this species has undergone a substantial expansion in Britain, coincident with the population increase in Wales and Scotland. The species has also colonised Ireland, with breeding first proved in Northern Ireland in 2006. Information on density changes is also available, as the fieldwork for the latter two Atlases included fixed-time bird counts in 2km x 2km squares (tetrads) within each 10km square. These tetrad-level records have been used to publish local Atlases in many regions, including North Wales[3].

Reasons for changing populations

Why have certain species prospered and others dwindled? In most cases, there are possible reasons which can be deduced from other data held by the BTO on nesting success (Nest Records Scheme) and survival of young or adults (ringing studies). The changes in great spotted woodpeckers and starlings are thought to be linked; when starlings bred commonly in woodland they often tried to take over nest-holes excavated by woodpeckers which consequently suffered reduced breeding success. Low over-winter survival of young starlings (possibly following changes in livestock rearing) has caused the starling decline and the woodpeckers have benefitted!

The house sparrow increase in Wales contrasts with the decline in many parts of Britain, which has led to red-listing for this species. The main cause for losses on farmland is thought to be changes in farming practice. However, it is not clear to what extent the Welsh house sparrows are in built-up areas, rather than on farmland. And what can we say about goldcrests, which have dropped by 52% in Wales but increased by 13% in England? As the smallest British bird, they are sensitive to cold winter weather (which can cause mortality) but it is likely that their decline is due to a combination of factors.

Further information on what might cause population changes in these or any other species can be found on the BTO website[4].

Conservation use of the BBS counts

The data for each species indicate which species are declining and may need active help; many of these are red or amber-listed in 'Birds of Conservation Concern'[5]. Much work is still needed to discover the cause in each case. Once the reasons for a species' decline are known, or at least guessed at, actions can be undertaken which should help to reverse the trend. For example, the seed-eating yellowhammer is mentioned above as a much-declined species in Wales; it should be possible to tackle this by promoting agri-environment schemes which improve winter seed availability.

Where do we go from here?

BBS recorders are mostly happy to turn out each spring to do their transect counts, absorbing occasional changes to the methodology or information requested. They probably give little thought to the real importance of this continuous surveillance of our breeding birds. Wales and the UK have probably the best recorded avifauna in the world, but this is of little value unless the evidence is used to get better management of our countryside and towns to support our birds. In view of the real declines in numbers and range which many of our breeding birds have suffered on farmland and now increasingly in woodland, perhaps we citizen scientists should become rather more politically active, encouraging our representatives in Cardiff and Westminster to take action. There is a limit to what can be achieved with a pair of binoculars and a clip-board!

***Geoff Gibbs**, a regular contributor to Natur Cymru, returned to North Wales in 2001 after an absence of 30 years. He is BTO Regional Representative for Caernarfon. The Breeding Bird Survey is jointly sponsored by the BTO, the Joint Nature Conservation Committee and the RSPB.*

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Tom Marshall (RSPB-images.com)

Yellowhammer *Emberiza citrinella* Bras melyn.
This seed-eater feeds its young on invertebrates

Cyfrif adar sy'n bridio

Mae llwyddiant Arolygon Adar Bridio, a gynhelir gan yr Ymddiriedolaeth Adareg Brydeinig (BTO), yn dibynnu ar ymroddiad a phrofiad nifer o gofnodwyr amatur ledled Cymru. Mae nifer cynyddol o sgwariau cofnodi 1km yn rhoi darlun cliriach inni o dueddiadau poblogaethau adar. Cymysg oedd y canlyniadau rhwng 1995 a 2014, gyda niferoedd y gnocell fraith fwyaf, y telor penddu, aderyn y to a'r nico'n cynyddu, tra bo gostyngiad yn niferoedd y ddrudwen, y brasmelyn, y gylfinir a'r dryw eurben. Credir bod y newidiadau yn niferoedd y gnocell fraith fwyaf a'r ddrudwen yn gysylltiedig â'i gilydd. Yn aml mae'r ddwy rywogaeth yn cystadlu â'i gilydd am dyllau nythu mewn coetiroedd, a'r ffaith bod nifer fechan o ddrudwy ifanc yn goroesi'r gaeaf (o bosibl yn dilyn newidiadau mewn magu da byw) wedi bod yn fanteisiol i'r gnocell.

Iwan Edwards

Wildlife in orchards, churchyards and gardens

Caerwys school children help to dry the hay in more creative ways

When people come into contact with nature the fun begins, and creates the chance of securing a lasting place for nature within Society. Where better to enable this to happen than in orchards, churchyards and gardens? An innovative project is involving people to help wildlife in these places, as ***IWAN EDWARDS*** *reports.*

What links our orchards, churchyards and gardens? One of the first and most obvious answers would be people. These are places made by us and for our purpose, they nourish us, and more importantly they connect us to the natural world. People's most common form of contact with nature will often happen in these places. They are on the frontiers of enchantment with the natural world. They give us a sense of place – an increasingly important concept for our digital, detached society.

Gardens, orchards and churchyards all offer diversity of habitat, from the garden pond to the compost heap, providing an abundance of food in the nectar-rich plants and short grass. They provide shelter in walls and meadows, and space for wildlife to live and breed in the hedges and trees.

The policy-makers and scientists of the future will know gardens, they will know of worms and woodlice, mud and grass, they will know churchyards, the trees, the tumbling stone walls and the bats in the belfry, and they will know of that apple or old damson tree at the

bottom of Nain's garden with the furry lichens hanging on the branches like an old man's beard. An appreciation for these things they will have, because that's how we all came to appreciate nature. The smell of damp grass, the dawn chorus, snails on the garden wall, a mouse brought in by the cat, the mud cakes and the twigs. The wild cherry tree growing at the bottom of the garden was my first and most powerful connection to the natural world. I know every inch of its bark and branches. It is from this connection that as an adult I possess awareness, and with it, a profound sense of loss.

The facts and figures are depressing: 98% loss, 60% decline, 94% reduction. Yet we hardly need the figures as proof. Talk to anyone with a memory of our landscape before the Second World War and they will tell you how they don't hear skylarks or yellowhammers anymore. Never catch the glimpse of a hare, or see a hedgehog, never notice herb-rich meadows or remark at well-laid hedges thick with fruit. Nature's Larder has been depleted, and these frontiers where people and wildlife come together are becoming essential in our fractured landscape.

Orchards

A study of orchards in Wales reported a 94% reduction in area of orchards in the agricultural census between 1958 and 1992[1]. In accordance with obligations set out in the Convention on Biological Diversity (1992), the UK Governments agreed that traditional orchards should be given priority habitat status under the UK Biodiversity Action Plan (BAP). As a result, North Wales Wildlife Trust (NWWT) secured funding from the (former) Countryside Council for Wales and SITA Trust to deliver the North-East Wales Orchard Recovery Project.

Iwan Edwards

Volunteer Simon Smith using the hand hay bailer at Gwaenysgor churchyard

Working with partners Coed Cymru, Footprints and Flintshire County Council Biodiversity staff, we are progressing the work of the North-East Wales Orchard Initiative (2003). Old orchards have been identified, and essential restorative pruning has brought over 30 traditional orchards back into active growth. Well over 2,000 trees have been planted at 130 orchard sites in north-east Wales, creating nearly 3ha of new orchards. In addition we have maintained more than 3ha of existing orchard sites and worked with over 50 schools and community gardens to create mini-orchards.

As biodiversity hot-spots within our landscape, orchards once provided a network of habitats, a source of food and shelter not only for those organisms of limited range or territory but also for those which move through the region. The aim of the Initiative is to revive these essential habitats, safeguarding wildlife including common toad, great crested newt, linnet, hawfinch, bats, dormouse, hedgehog, reptiles, beetles, moths and butterflies.

Traditional orchards have a historical significance and can be traced back many centuries. Today these are the orchards which tend to have a high environmental

Iwan Edwards

Ox-eye daisy in an old graveyard near Holywell

and horticultural as well as a historical importance. Steve Oram in a recent *Natur Cymru* described an all-Wales survey of old orchards[2]. Most modern orchards use varieties of trees that are dependent on fertilisers and pesticides, whereas the old orchards have a high degree of fruit-tree species variation and do not require the intensive use of chemicals. Eight new heritage varieties indigenous to North Wales have been identified at our traditional orchard sites. These have been propagated and grown on for planting at new and existing sites, safeguarding our local varieties for future generations. All the trees were given Welsh girls' names, so look out for the likes of Catrin, Mairwen and Myfanwy.

Churchyards

Throughout the UK, living churchyard projects are helping to ensure the survival of grassland species that are now rare or uncommon, such as pignut, meadow saxifrage and burnet saxifrage. Different types of stone used in church walls and gravestones also represent a valuable habitat, providing a home for numerous species of lichens, mosses and ferns, some of them dependant on churchyards for their survival.

Patches of woodland, hedges and shrubs are often present along churchyard boundaries. They form a largely undisturbed habitat for species such as butterflies, slow-worms, lizards and bats – provided, of course, that they are managed sympathetically.

In 2012 NWWT launched a pilot scheme in rural Flintshire to help communities make provision for wildlife in their churchyards and burial grounds. With funding from the Rural Development Agency Cadwyn Clwyd Cyfyngedig, the project was extended into Denbighshire and momentum is now well underway.

The first step involves the survey and assessment of the churchyards, highlighting what riches are already present and identifying ways of encouraging them. The most useful method of improving these sites is simply to alter their management. In older churchyards, where graves are rarely visited, grass cutting can be less frequent and done more creatively, allowing wildflowers to complete their life cycle.

The project also provides an opportunity to revive the tradition of communal haymaking. To further this, we have invited communities to attend heritage skills workshops, where over a hundred people have been trained in the use of the Austrian scythe to manage grasslands. This lightweight and extremely versatile tool is being used for an increasingly wide range of conservation purposes, including the control of invasive non-native species.

Communities have also gathered, pitchfork in hand, and tried their hand at 'progressive haymaking', mimicking the old hay season which would have lasted 4-8 weeks. This approach introduces an age-mosaic of grassland species, rather than the industrial blitz of modern haymaking where an entire landscape rich in life becomes a desert in a day. This approach is made possible by the adaptation of an ingenious hand Hay Bailer based on a machine used to bale pine needles in Texas.

Groups who are managing these grasslands can now scythe small sections and then make bales, with little effort and without the need for expensive machinery, progressively working their way through the hay meadow. Grazing is another way of managing churchyards and, between the sheep and the scythe, many of these sites are once again being managed in the ways of old.

But it's not just the flowering plants which benefit. Equally rare in today's landscape are the waxcap fungi which flourish in these unimproved grasslands. The grass cuttings tipped on a compost heap provide a refuge for reptiles, amphibians and small mammals. Other instant homes include boxes for birds, solitary bees, bumble bees and bats, which provide shelter and a place to breed. Ancient trees also live here, supporting an abundance of organisms dwelling at the lower end of the food web. Hedges, shrubs and scrub all add to the richness of habitat. These graveyards are alive with the sounds of nature simply because the pressure we place on the land is minimal.

Gardens

Although we place far greater demands on our gardens than on orchards and churchyards, garden wildlife is both varied and surprising. Incredibly diverse and covering an area larger than all the UK nature reserves combined, gardens are essential green spaces where wildlife can thrive. My experience comes partly from working with the Wildlife Gardening Project, now managed by NWWT. This has offered help to schools and communities who want to improve local green spaces for the benefit of wildlife. An outstanding example is the Henllan Conservation Group, set up in 2010 at the insistence of local members of the Women's Institute. NWWT were involved from the start with their 'Henllan Bee Project', created in an effort to address the plight of our pollinators.

Iwan Edwards

Volunteers scything at Llanasa village graveyard

Iwan Edwards

Iwan Edwards

Drying the hay on gravestones

Since then, the group have since been responsible for:

- creating a wonderful ‘Bee Garden’ on a disused and very rocky slope that you wouldn’t dream of cultivating.
- planting bulbs
- erecting bird boxes
- building compost heaps
- promoting conservation as a management tool in the village churchyard
- running a series of education workshops and talks in the village hall to inform others of the significance of their efforts
- involving the whole community, no matter what generation or ability.

Knowing that a new sheltered housing estate was to be built in the village, they applied their collective pressure on a nationwide housing association to consider wildlife within their landscaping scheme. Two years later a wildlife-friendly sensory garden and a wonderful new butterfly garden have been created, with no monoculture planting in sight.

In August this year Iolo Williams attended the unveiling of new information boards in the village which help to inform the public about the significance of creating and looking after these important wildlife habitats. The media loved it, and now others who read the story may be inspired to do the same. All this was made possible through the efforts of enthusiastic volunteers who had the will to get up and do something about it. They galvanised their efforts by working alongside organisations like the Wildlife Trust and sought guidance and hands-on help from their local countryside services and county biodiversity officers. They sourced European funding through Cadwyn Clwyd Cyf and sought expertise and experience to help make the correct choices. Individuals, organisations, businesses and charities, all worked together for the benefit of people and wildlife.

***Iwan Edwards** works for the NWWT delivering projects that benefit people and wildlife. His current role as OPAL community scientist promotes ‘citizen science’ in Wales.*

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1. Oram, S., Alexander, L. & Sadler, E. (2013). *Traditional Orchard Habitat Inventory of Wales*. Natural Resources Wales Commissioned Report. CCW Policy Research Report No. 13/4.

2. Oram, S. (2013). *Traditional Orchards – a new habitat map for Wales*. Natur Cymru 49.

Bywyd gwyllt ym mherllannau, mynwentydd a gerddi

Mae perllannau, mynwentydd a gerddi oll yn fannau agored a grewyd gan bobl at ddibenion penodol, ac yn aml dyma fan cyswllt cyntaf llawer ohonom â natur. Maent yn aml yn noddfeydd gwerthfawr ar gyfer bioamrywiaeth mewn byd o goncrit, ond mae arnynt angen rheolaeth ofalus. Gwelodd y 60 mlynedd diwethaf ddirywiad gofidus yn eu cyflwr: mae’r rhai sy’n ddigon hen i gofio’n sôn am dirwedd fu gynt yn llawn bywyd gwyllt. O’r diwedd, rydym yn dechrau gweld eu gwerth i fywyd gwyllt, ac y mae ymdrechion ar gerdded i reoli’r mannau hyn mewn modd sy’n fuddiol i bobl ac i fywyd gwyllt fel ei gilydd.

Buglife

Brownfield stepping stones

Brownfield sites are those that have been altered by human activity; often this creates a unique pattern of habitats within a small area, allowing a rich variety of wildlife – and particularly invertebrate species – to co-exist. Some brownfields can have as many rare and threatened invertebrate species associated with them as ancient woodlands. Brownfields can also be vitally important as 'stepping stones' for wildlife, as the microhabitats they contain have become rare and fragmented in the wider countryside. Unfortunately they are often forgotten, under-valued, and under increasing pressure from developers, resulting in habitat being lost at an alarming rate.

West Glamorgan Stepping Stones

Over the past six years Buglife has been undertaking a number of 'Stepping Stones' projects across the UK to gain a better understanding of brownfield habitats, the biodiversity they support, and how best to manage them. Thanks to funding from WREN, Buglife is now two years into its first large project in Wales, 'West Glamorgan Stepping Stones'.

The brownfield project sites – Kilvey Hill and Pluck Lake (City and County of Swansea); Cymmer Tip and Bryn Tip (Neath Port Talbot County Borough Council); and non-operational land at Tata Steel's Port Talbot works – are relics of the coal mining, heavy metal mining and smelting industries: Swansea was once known as 'Copperopolis – the copper capital of the world'. The industrialisation that took place before any environmental controls were introduced created a legacy of contaminated land, but some of these sites now form some of the best wildlife habitats for rare and endangered species.

The varied and often stressed ground conditions found on brownfield sites can support mosaics of bare ground, wildflower rich grassland, heathland, lichen heath and scrub – perfect environments for invertebrates, many of which have complex life-cycles requiring two or more habitats in close proximity. A key focus of our efforts has been to maintain or create these mosaics.

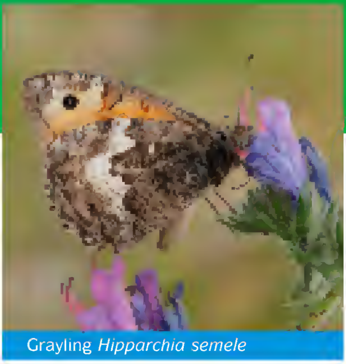
At Kilvey Hill, for example, Buglife and Swansea Council have been working with volunteers from Swansea University to increase the area of existing heathland by selectively thinning encroaching conifers. This complex of heath, short-sward grassland, loose bare ground and scrub is supporting nationally scarce species, from the ground beetle *Amara equestris* to the more common yet nonetheless impressive Green tiger beetle *Cicindela campestris*. Even the felled tree stumps provide habitat for invertebrates, including Red longhorn beetle *Stictoleptura rubra*, whose larvae feed for 2-3 years in the dead wood before emerging as adults.

Bryn Tip, site of the old Bryn Navigation Colliery, is a designated Local Nature Reserve sitting prominently within the village. Neath Port Talbot CBC and Bryn Residents Action Group have worked to protect the site, and have maintained the open structure of the site's species-rich grassland by selective scrub thinning and removing invasive non-native species, which benefits butterflies such as the Dark green fritillary *Argynnis aglaja* and grayling *Hipparchia semele*. Gorse scrub is also an important habitat feature, and is being managed for reptiles including common lizard *Zootoca vivipara* and slow-worm *Anguis fragilis*, and birds like the linnet *Carduelis cannabina*.

At Tata Steel Port Talbot, the Bumblebee Conservation Trust have recorded the shrill carder bee *Bombus sylvarum*, whose distribution is now restricted to small areas of the south and east of England and the South Wales coast. Next year Buglife will be working with Tata Steel to enhance habitat for this rare bumblebee, which will also benefit a wide range of pollinating insects and other invertebrates.

Clare Dinham
Buglife Conservation Officer

Buglife is the only organisation in Europe dedicated to the conservation of all invertebrates, aiming to halt their extinction and achieve sustainable populations. ***www.buglife.org.uk***
WREN is a not-for-profit business that awards grants for community, conservation and heritage projects to those living close to landfill sites.
www.wren.org.uk


Iain H Leach
Grayling *Hipparchia semele*

Leafhopper diversity in a Cardiff urban meadow

Around a year ago, in the centre of Cardiff, a plot of mown grass at the back of the Museum was allowed to grow as the first step towards creating an urban meadow, concentrating on native plants.

A year later in September 2014 and the grass and herbage structure has changed markedly and is full of leafhoppers and planthoppers, which were not present there before. Six species were found by vacuum sampling and totalled about 150 specimens in a square metre – so perhaps 29,000 hoppers were living in our meadow. An equivalent sampling area alongside contained just 10 specimens.

Leafhoppers, planthoppers and spittlebugs (Auchenorrhyncha) and the true bugs (Heteroptera) (together comprising the Hemiptera along with aphids and scale insects) are a group of sap-sucking insects that may be very common in grassland. There is an extensive and varied literature in the UK and continental Europe which shows differences in species composition and abundance as a result of changes in grassland management. They are therefore an excellent group to use to investigate differences between meadows and grasslands. So why are they not used more often in studies of grassland management? Is it just that they are considered taxonomically difficult? For leafhoppers and planthoppers there are good modern guides to identification and the taxonomy is relatively stable but, as with so many groups, the examination of male genitalia may be necessary to confirm some species.

Life cycle

The biology is relatively straightforward but with some interesting individual variation: there may be one or two generations a year, with the majority of species overwintering as eggs laid into plant tissue by the females using a sword-like piercing ovipositor. A few hibernate as nymphs and become adult early in the year, while others spend the winter as adults, mating in the spring and laying eggs into fresh plant growth. Most are narrowly oligophagous: that is, they will breed only on a narrow range of host plants, but might feed on a wider variety. The majority of species feed from phloem tissue, in some cases responding to changes in nitrogen flow in the plants. A few feed from xylem tissue, including the leafhopper *Cicadella viridis*, and the meadow spittlebug *Philaenus spumarius* (which does have a large number of host plants – but not including grasses). One leafhopper subfamily utilises mesophyll cells, removing the cell contents and creating white stippling on leaves – a practice especially evident in tree-associated species.

Adults in some species of leafhopper and delphacid planthopper may have two-wing forms. Macropterous (long-winged) individuals can fly and disperse to other habitats while brachypterous (reduced wings) individuals cannot fly. Some species, often found in stable, unchanging habitats, are always short-winged. But among those species that are usually short-winged, long-winged adults may also appear when the conditions become unsuitable. It seems the nymphs are able to sense when the conditions might become too dry and they are able to disperse by developing the long-winged forms in the final moult.

It follows that the best colonisers to have found our urban meadow will have been able to respond to the opportunity of a longer and more architecturally diverse grass sward. It will be interesting to see which further species can be recorded next season.

Tristan Bantock

Arthaldeus pacuellus, a leafhopper that was abundant on the meadow

Mike Wilson
Head of Entomology
National Museum Wales

From the **Garden**

A sustainable future from a Regency past

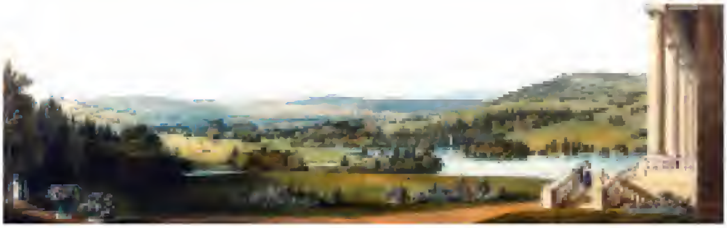


Image with the kind permission of the Grant family

It may be the youngest national botanic garden in the world but the National Botanic Garden of Wales occupies a horticultural site that goes back more than 400 years.

The early 1800s saw the heyday of Sir William Paxton's estate, one of the finest late 18th century landscapes and water parks in Britain. His house, too, was described as one of the finest in south Wales, and both house and park were created by two of the leading designers of the age, the architect Samuel Pepys Cockerell and the landscape designer Samuel Lapidge, 'Capability' Brown's professional heir. Lapidge's close working with Cockerell and the engineer James Grier produced a landscape of singular elegance and distinction, with fine neo-classical water-related structures and lovely parkland features including the famous Paxton's Tower.

Now, half way through its second decade, the Botanic Garden is maturing well and the restoration of the 18th century landscape and water features is a key objective for the next five years. Costing £6.7 million, it has significant backing from the Heritage Lottery Fund and other charitable trusts, and will have wide appeal to visitors with its re-creation of the features and vistas so much admired 200 years ago, opening up many more areas for leisure and learning.

It will also create an opportunity for a more detailed interpretation of the Garden's history and its important geographical and cultural position in Wales's heritage. Both Paxton and his predecessors, the Elizabethan Middleton family – who first created the estate still known as Middleton Hall – were involved in the East India Company, and it is the proceeds of such adventuring and profit from trade (not least in plants for health) that gave rise to the magnificent park.

Biodiversity benefits

Naturally, the restoration will affect the biodiversity of the site. The major changes will be in and around Llyn Mawr, the largest of the necklace of seven lakes built 200 years ago. This silted up over time and, around 12 years ago, was completely drained. Its banks and valley sides have largely been taken over by invasive scrub and rank vegetation typified by large stands of reed canary-grass *Phalaris arundinacea*, soft rush *Juncus effusus*, tufted hair-grass *Deschampsia caespitosa* and lesser pond-sedge *Carex acutiformis*. Removing this relatively new vegetation will allow the existing mature, deciduous trees on the edges of the lake to grow without undue hindrance and competition. Hopefully this will enhance their potential to provide substrate for important tree-growing lichens similar to those on parkland trees in nearby Dinefwr Park. New trees will also be planted strategically around the site, both for aesthetic reasons and to act as stepping-stone trees for fauna travelling between adjacent habitats.

European Protected Species such as otters, bats and dormice have been recorded nearby. Making the site friendly to these creatures, by establishing artificial holts, for example, could significantly aid their long term preservation elsewhere. We are also studying the viability of attracting nesting osprey.

The past 14 years have seen a significant improvement in the quality of the biodiversity in nearby fields, which are now managed organically, grazed strategically and, in a few cases, cut once a year as traditional hay meadows. The restoration will provide opportunities to continue grassland restoration in adjacent meadows.

We hope, in time, that visitors will not only be able to enjoy a fully restored Regency landscape but also to see, hear, smell and touch the flora and fauna that Sir William Paxton would have been familiar with.

***Rob Thomas** and **Bruce Langridge**, with additional material by **Richard Pryce**, of Pryce Consultant Ecologists. Richard is also a trustee of the National Botanic Garden of Wales.*

Nature at large

Habitat management at Rhosgoch wood

This winter we return to Rhosgoch wood – a magical place. Purchased in 2000, this 30 acre woodland was previously a sitka plantation (on rhos pasture) that was harvested around 1995. It had been replanted with sitka prior to the sale, but much of the replanting failed due to weevil damage. Under the new ownership, the Woodland Grant Scheme agreement for Rhosgoch was altered to include natural regeneration and planting of native hardwoods to replace the failed sitka. In ten years there has been quite a transformation – it is amazing what nature can do with a helping hand, and some good muscles behind those hands!

Before and after

Comparison photos have been a really useful tool. After the purchase the site somewhat resembled a battlefield, with freshly cut tracks where big machines were used on very wet ground to harvest timber and prepare for restocking. More recent photos show a sensitively managed, flower-rich main ride that supports orchids, yellow-rattle, devil's-bit scabious and marsh fritillary webs. Open water supports many dragonflies including the southern hawker and four-spotted chaser, damselflies, mayflies, kingfisher, water rail and moorhen, with evidence of otter and water vole. Half of the pond's edge is grassland, while trees and scrub provide cover on the other half. Elsewhere, unplanted areas have developed into open areas of *Molinia* tussocks where reed bunting, sparrowhawk, woodcock and tawny owl have been seen.

Ivy Denham

Opening up the main ride at Rhosgoch

The woodland has been very sensitively managed in the last 14 years. The rides are maintained as grassland, with the vegetation and scrub encroachment topped annually by our 4-foot wide, low impact machine (avoiding the marsh fritillary area). Scattered sitka that survived the weevils, or which self-seeded from surviving trees, are controlled on rotation. Due to the sensitivity of the site, this work is all done on foot with a chainsaw, and where necessary a portable winch to remove the timber. Accessible timber is transported with a small tractor and log trailer, as seen in *Natur Cymru* 52:46. Inaccessible timber is stacked and left in situ as habitat piles. This gentle approach really pays off when you see light streaming through the remaining young hardwoods on a sunny winter's day, knowing how much this will benefit the ground flora, regeneration, and the associated wildlife in the coming years.

Change of heart

One small area of sitka was not felled with the rest of the plantation in the 1990s. Some years before the main block was harvested it had suffered wind-blow, and had been cleared and replanted. This meant the timber was not ready for harvesting with the main block, so was left. The dead ground below the dark sitka was a thick matt of brown needles and compost with none of the ground flora found under the broadleaves, and initially this small stand was deemed an unsightly blot that would be removed when time and resources allowed. However, as time went by it was noticed that fly agarics were seen only under the mature sitka, herons chose to nest there each year, and goldcrests and many kinds of tits were seen regularly. With such an interesting variation in habitat, this small block of mature sitkas was reprieved and left in situ.

This area again suffered some wind-blow at the end of last winter, and we have been busy clearing it up. A great deal more light is now reaching the ground, and it will be interesting to see what effect this will have in the next few years. Nature make its own choices; although we are land managers, we are merely working alongside.

Ivy Denham
Conservation and Trees

After the 2013-14 winter storms

During the calm weather in summer 2014 it was easy to forget the storms of winter 2013-14. A useful round-up of the impacts on the Welsh coast, such as the erosion of fore dunes, exposure of submerged forest peat beds and losses of rocky shores animals, was produced by Natural Resources Wales. Understanding the ecological significance of such events requires rapid responses. Reading between the lines, many of the observations came from individual initiatives by ex-CCW 'scientists' (are they still called 'scientists'?). Controlled ecological experiments are nigh-on impossible in the sea, so studying the effects of weather or pollution can substitute. In 1967 when the *Torrey Canyon* foundered off the Cornish coast, the effects of massive oil pollution were largely unknown. The then Director of the Marine Biological Association laboratory in Plymouth temporarily switched almost all his staff towards field work and laboratory studies on the toxicity of the dispersants then being used on a large scale for the first time. This was before Britain had an Environment Agency, and the MAFF Fisheries Laboratories, later to evolve into CEFAS, was almost entirely concerned with commercial fisheries. In due course the MBA produced a very instructive book. I remember reading this and wondering how the marine scientists of Wales might have coped given the dispersal of relevant ecological expertise between agencies and academia.

After the storms

Following the disturbance to the uppermost levels of many beaches, it was natural to consider what might be the fate of flowering plants on beaches in summer 2014. In the event, several of the annuals have had a particularly good year. The most obvious was sea rocket *Cakile maritima*. It flourished not just where expected on the open shore, but up amongst the marram grass, where strandline debris and seeds were thrown. At one spot in Newborough Forest it even grew amongst living pine trees. The oraches *Atriplex* spp. also grew abundantly on the decaying seaweed and some were amongst the scrub on top of low cliffs where wave splash had reached. Some of these salt tolerant plants are known to germinate better in fresh water so, while the sea may have dispersed them, the rains may have helped. On rocky shores where the storms tore off so many animals, the vacant spaces have been largely taken by a huge settlement of barnacles (mainly *Semibalanus balanoides* in North Wales).

One of the more unusual finds this year came from a grab survey of the benthos of Tremadog Bay. It was an individual of one of the minor Phyla of worm-like animals, the Echiura *Maxmuelleria lankesteri*. These animals burrow deeply into mud on the sea bed. An apocryphal story relates that decades ago there was uncertainty about sediment accretion off Cumbria that might bury particles of certain nuclear isotopes. One school of thought suggested that natural accretion would solve the problem, but others considered this was a false impression due to burrowing animals turning over the sediment. The research vessel sent to investigate spent days trying to sample the deepest burrower in this habitat, which happened to be *Maxmuelleria*, but without success, only to find the worms hanging off the ship's anchor when it was brought up. Serendipity often plays a part in records of less common marine animals too. A number of *Maxmuelleria* were found for the first time in Welsh waters in 2005, tangled in equipment for sampling the clam *Arctica islandica*. This was also in the outer part of Tremadog Bay, known as Muddy Hollow.

Maxmuelleria lankesteri

Ivor Rees

Scientific sampling of the seabed has become more complicated since the introduction of regulations which require permits to deploy even the small grabs that take only a tenth of a square metre. A further anomaly is that academic institutions in Wales must apply for separate permits for all studies, while the CEFAS laboratory in Lowestoft was given an open permit. The Marine Management Organisation sometimes takes several months to process applications. A permit regime appropriate for large scale proving of potential aggregate dredging resources was surely never intended to inhibit biological research in the universities.

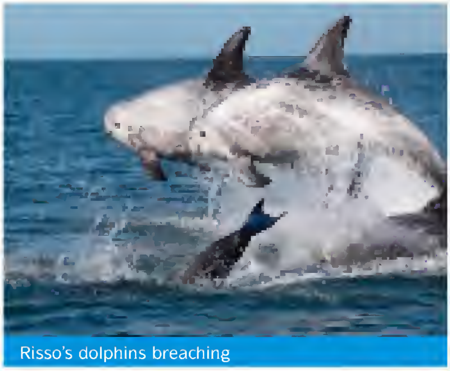
Ivor Rees

Life lines

Surveying Risso's dolphins

This summer, I joined Whale and Dolphin Conservation (WDC) on Bardsey Island, to help survey one of our least well known dolphin species. Risso's dolphin *Grampus griseus* is one of the largest members of the dolphin family, with adults reaching up to 4m long. They are covered in distinctive white scars and scratches, thought to be caused by social interaction, making them appear light grey and even white as they get older. The large, blunt, rounded head, with no beak, distinguishes Risso's from more familiar species such as the bottlenose dolphin or common dolphin.

In Wales Risso's dolphins are typically found in the deep waters off Pembrokeshire, the Llŷn Peninsula and Anglesey, where it is thought they feed on squid, octopus and cuttlefish. Bardsey is an ideal base from which to search for these animals. WDC have been studying them here since 1997[1], originally with support from the Countryside Council for Wales and now from Natural Resources Wales. Sightings are most frequent in the summer months, and they are known to breed in the region.


Pine Eisfeld-Pierantonio

Risso's dolphins breaching

Using photo-ID, individual animals can be recognized and matched to previous sightings by unique features such as nicks or scratches on their fins. This long-term survey has revealed that the same individuals re-visit the area, with one pair of dolphins re-sighted after a gap of nine years. It has also revealed long distance movements – an individual seen off Bardsey in 2006 and 2007 was subsequently photographed in Cornwall in 2009. Such detail can only be learned through long-term surveying, and highlights the need for continued investment in this work.

We were lucky to spot a group of Risso's on our first day of survey and, under licence from NRW, launched the boat to photograph their dorsal fins for photo-ID. The dolphins appeared to be feeding, repeatedly flicking their tails high in the air to take deep dives over turbulent upwellings. Distant splashes alerted us to a breaching dolphin leaping out of the water, and a second group joined the first. They settled into a tight group of 11 animals, resting at the surface and slowly swimming in synchrony. My colleagues Pine Eisfeld and Vicki James from WDC tried to photograph each animal's fin from both sides: later, we were encouraged to see that one photo matched an individual seen in 2013.

Of course the golden rule of wildlife watching is that all the good stuff happens when you leave, and this survey was no exception. During the second week of the survey, when I was back at my desk, the WDC team had one of the best encounters they've ever had.

A group of over 30 Risso's dolphins appeared off the coast, and the team quickly joined them by boat. Pine described the encounter: "There was a mass of dolphin fins going down one after the other almost in the same spot. Ten or more dolphins simultaneously jumped out of the water in a circle and then crashed headfirst into the middle, with surface rushing, leaping and jumping so close to the boat that I couldn't get ID-shots because the camera couldn't focus!".

The rest of the week brought further encounters, making 2014 one of the most successful years of surveying. The photographs are currently being processed and examined for more matches. This work is important to help us to learn more about the biology of these animals in Welsh waters – for example we still don't know how far the population ranges, how many animals there are, and where they go when they're not here. By collaborating on long-term surveys like this one, we can continue to build the evidence we need to inform NRW's advice on the conservation and management of this truly special Welsh species.

***Ceri Morris** is the Marine Mammal Specialist for Natural Resources Wales. Her role is to advise and gather evidence on marine mammal conservation across Wales.*

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[1] *Natur Cymru* 38, p14

Mammals round-up

Muntjac, water vole and carrier bags

Muntjac deer: Reeves's muntjac are native to China and were first released in Britain in woods near Woburn in 1901. The smallest wild deer in Britain, they can have a serious impact in conservation woodland and are difficult to exclude as they can get through small holes. There have been reports for a few years now that muntjac have been spotted in Wales in various areas, but nothing was confirmed. However, Steve Griffiths from The Deer Initiative, using camera traps and thermal imaging equipment, has now obtained evidence of muntjac in the Lower Wye Valley area, a good few miles into Wales. The next stage of the Natural Resources Wales (NRW)-funded project is to assess the impact of these non-native deer on local biodiversity.

Water voles: Nia Stephens, WTSWW's Water Vole officer, spent the summer undertaking surveys in west Wales. The work was funded by the Welsh Government Resilient Ecosystems Fund, through NRW. With help in the field from volunteers, she has identified water voles present on a large number of sites in upland Ceredigion, on private land never previously surveyed. Records were also found on three of the Trust's reserves in Ceredigion: Cors Ian, Rhos Fullbrook and Llyn Eiddwen. Sites with old records in Pembrokeshire were surveyed, but sadly no signs of water vole were found. The work has shown the existence of isolated populations, and that the uplands of Ceredigion truly are a stronghold for this species in Wales. During the year Nia has assembled an inventory of landowners who are happy for work to be carried out on their land. If funding can be found to carry this out, it should lead to improved habitat connectivity between these fragmented water vole populations.

Reintroduced water voles: Gwent Wildlife Trust's post-winter survey showed a booming population of reintroduced water voles at Magor Marsh. It also located latrines nearly a mile away from the reserve. Throughout 2014 wider water vole surveys are supporting the Trust's work of raising landowner awareness and monitoring the growing population spreading across the Levels. In Carmarthenshire, reintroductions were also undertaken this summer on WTSWW's Ffrwd Farm Mire reserve. The project was led by NRW, and WTSWW have supported this with staff time, land management and mink control.

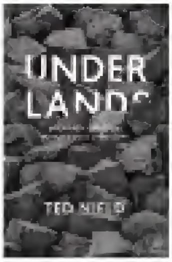
Mammals on your doorstep: Brecknock Wildlife Trust, supported by The Co-operative carrier bag levy, ran a series of educational events in Brecon, Hay and Builth Wells to raise awareness of wild mammals in the area. The aim was to encourage local schools and communities to record these species, which are often hard to see, and hence under-appreciated. As a result of this initiative, new sites have been reported for both water shrews and water voles.

Rob Strachan: The Wildlife Trusts in Wales wish to add a few lines to Huw Jones's tribute in *Natur Cymru* 51 (p52). Rob was so integral to the success of many mammal projects arranged by the Trusts, and special mention must go to his help with the water vole reintroduction work undertaken by Gwent Wildlife Trust. He was always so very generous with his time. He will be greatly missed and the success of these projects is a fitting tribute to his work.

Camera traps prove that muntjac have reached Wales

Frances Cattanach
Director, North Wales Wildlife Trust

Green **Bookshelf**



Underlands: A Journey Through Britain's Lost Landscape
Granta 2014
288 pages
Hardback £20

"All the answers to our questions about the future of our world lie in the past, in the rocks."

This statement may seem bold, but to geologists such as Ted Nield it makes perfect sense. *Underlands* weaves a deeply personal journey by the author with many examples highlighting the importance of geology to our everyday lives.

Nield emphasises the importance of the countless quarries that pepper the countryside as an insight into the geological past. Quarries around Swansea were instrumental in firing his interest in geology, and in the training of generations of geologists. The same can be said of every corner of Britain. The demise of the extractive industry has shut these 'windows on the past' and highlights the challenges for agencies responsible for geological conservation. There is an interesting section on the Horn Park Quarry NNR in Dorset. From Nield's university trips and holiday visits, to its declaration as a NNR, Horn Park Quarry sums up the conservation challenges for protecting our geological heritage.

The investigative and historical research required for this book is clear. A chapter on mining is replete with facts and figures which help highlight the importance of Wales in driving the Industrial Revolution. Alongside this, the sobering history of the Aberfan disaster in 1966 and the personal links to mining in the area bring home the human impact of exploiting the Earth's natural resources. The personal story continues when restoring the headstone of his great grandfather, a colliery Undermanager. Nield journeys to Aberdeen to the source of the granite, and follows the demise of the British granite industry and our reliance now on imported building stone.

This deeply personal journey is threaded through with fascinating geology and industrial archaeology, and is powerfully told.

Raymond Roberts

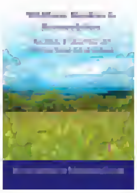
The Birds of Radnorshire
Peter Jennings
Ficedula Books, 2014
302 pages
Hardback £30

It's been a long wait for this book but good things are worth waiting for. The last county avifauna was a small booklet covering only 176 species, published in 1955. Pete Jennings has been the county bird recorder since 1986 and his volume covers all 254 species recorded up to 2013. It is a beautifully produced volume, with delightful line drawings by the renowned artist Alan Harris and an attractive selection of colour photographs.

The book draws on a wide range of records, including ringing recoveries, to present a very detailed picture of the past and current status of Radnorshire's birds. It is full of valuable information which will fascinate all naturalists who live in or visit this part of Wales. The effect of goshawk predation on the local kestrel population is a good example. The author's observations on fluctuating bird populations are always illuminating, and perhaps some additional comment on current conservation issues would have been welcome. Some assessment of the overall picture would have been interesting, especially as, in 2010, two thirds of Radnorshire birds were said to be in decline.

There are a few publication errors e.g. some small inconsistencies in use of capitals, and the index is out of sync with the text by two pages for each species. These are very minor quibbles which do not detract from the overall quality of the book. The Birds of Radnorshire is erudite and well researched. It is a fine example of the genre and a testament to the author's dedication.

Chris Ledbury



Wildflower Meadows in Monmouthshire: ten years of conserving and restoring flower-rich grasslands
48 pages
£5 +£2 P&P, cheque payable to Monmouthshire Meadows Group
Send to Maggie Biss, The Old Rectory, Hope Mansell, Herefordshire HR9 5TL

If you feel passionate about flower-rich meadows humming with insects on a summer's day and would like to do something to ensure their survival for the future, but are not sure how to go about it, then this is the book for you.

Concerned about the continuing loss of flower-rich fields and pastures in Monmouthshire, a group of landowners set up the Monmouthshire Meadows Group early in 2003. Members of the group can call on experts to survey their fields and to advise on appropriate management to maintain or enhance the variety of species on their land. This can involve considerable work to reverse decades of neglect or, paradoxically, reversing years of ‘improvement’.

After ten years more than 100 members are managing 600 acres, from hay meadows and pastures on small farms to mini-meadows in gardens, churchyards and roadside verges. Many of these sites now merit inclusion in the Wildlife Sites Register of the Gwent Wildlife Trust. Several members have written accounts of the management of their land – including an account of the restoration of a neglected wedge of land between two communities which now provides not only a pleasant green space but also a valuable outdoor classroom for the adjacent primary school.

This is a ‘How to do it’ book: classification of grasslands, grazing, haymaking, the “Dos and Don’ts” of management, where to look for funding, the possibilities of co-operating with like minded bodies.

The book concludes with their hopes and plans for the next ten years – I’m already saving up to buy my copy of “20 years of conserving and restoring wildflower meadows in Monmouthshire.”

Anyone wishing to set up a similar scheme should purchase a copy.

Jane Rees

Cyfres Am Dro
Creaduriaid Bach

Cyfres Am Dro
Angharad Tomos
Y Lolfa 2014
£3.95 pob un

Un o’r heriau mwyaf rydan ni’n ei wynebu yn y byd gwarchodaeth natur y dyddiau hyn yw cwestiwn sut i ysbrydoli cenhedlaeth newydd o bobol ifanc. Heb i wreiddiau diddordeb gael eu plannu’n gynnar ym mhlentyndod, ni fyddai perthynas gyda’r amgylchedd naturiol yn datblygu, ac mae yna berygl i bobol dyfu heb werthfawrogi bywyd gwyllt o gwbl. Mae’r gyfres hon gan Y Lolfa, yn ceisio taro ergyd yn yr ymdrech yma, gyda 4 o lyfrau i blant ifanc; *Adar*, *Coed*, *Blodau* a *Creaduriaid bach*. Maent yn defnyddio cymeriadau cyfarwydd Rala Rwdins ymhlith lluniau deniadol, testun syml, ac ambell linell o farddoniaeth Gymraeg i greu cyflwyniad i rywogaethau cyffredin fyddai’n apelio i blant o dan 10 oed. Gwnaeth fy mhlant i ymateb yn frwd, yn enwedig i’r ffeithiau bach diddorol /doniol, ac rwyf yn croesawu’r gyfres – gobeithio y cânt eu gwthio gan yr ysgolion, y llyfrgelloedd a.y.y.b.. Wedi dweud hynny, ac er eu bod yn llyfrau plant, mae’r adarwr y tu mewn i mi yn gorfod protestio bod y Dylluan Wen a’r Gwdihŵ yn ddau aderyn gwahanol… hyd a gwn i, dydy’r Dylluan Wen byth yn dweud ‘tw-wit-tw-ŵ’!

Ben Stammers

Glyndŵr's Way
Paddy Dillon
The Ceredigion and Snowdonia Coast Paths
John B Jones
The Severn Way
Terry Marsh
All Cicerone 2014
£12.95 Softback

Three titles have been added to this very popular series of pocket-size walking guides. *Glyndŵr's Way* is the 135 mile National Trail which follows in the footsteps of our hero Owain Glyndŵr; a circular route from Machynlleth to Welshpool, then south on Offa's Dyke Path to Knighton, before returning to the start point by way of Llanidloes. From Porthmadog to St Dogmaels, the 145 mile section of the Wales Coast Path is mapped in 16 day stages, some described as challenging and requiring a good level of fitness. Finally, *The Severn Way* follows Britain's longest river some 220 miles from its source to the sea.

Packed with information, maps and illustrations, these are essential requisites for anyone wishing to follow these routes. Both *Glyndŵr's Way* and the Coast Path guide have short sections on the natural history to be encountered.

David Saunders

Cynhadledd Partneriaeth Bioamrywiaeth Cymru 2014
Wales Biodiversity Partnership Conference 2014

Cynllunio adfer natur yng Nghymru

Cafwyd cynrychiolaeth dda o bob cwr o Gymru yn y gynhadledd 2 ddiwrnod hon. Daeth gwneuthurwyr penderfyniadau a phobl sy'n datblygu'r dystiolaeth, a rhai sy'n gweithredu ar y tir. Bu'r gynhadledd yn llwyfan i'r holl chwaraewyr allweddol hyn i drafod yr hyn sydd ei angen i wrthdroi colled bioamrywiaeth a helpu adferiad natur. Y tair problem oedd yn cael eu crybwyll dro ar ôl tro oedd y diffyg tystiolaeth galed i ategu penderfyniadau, pwysigrwydd cyfleu'r neges i'r cyhoedd, a diffyg adnoddau tymor hir i weithredu'r hyn sydd angen ei wneud.

Er mwyn helpu'r ymdrechion hyn yng Nghymru ceir adnodd eang o wirfoddolwyr ymroddedig a gweithredol a chanddynt y posibilrwydd o wneud gwahaniaeth gwirioneddol fel 'gwyddonwyr-ddinasyddion' a thrwy weithredu'n ymarferol. Er mwyn cyrraedd y bobl hyn mae rhaid inni ymestyn allan atynt mewn iaith sy'n hawdd ei deall, a buddsoddi yn y cymorth sydd ei angen i gydgysylltu, annog a gwerthfawrogi'r bobl hyn a'r gwaith y maent yn ei wneud.

Am mwy o fanylion ewch i **www.biodiversitywales.org.uk**

Nature recovery planning in Wales

This two-day conference was well attended by delegates from all over Wales. Decision makers came together with people who develop the evidence, and those who take action on the ground. The conference provided a platform for all these key players to discuss what is needed to reverse biodiversity loss and help nature recover. Three issues which were repeatedly mentioned were the lack of hard evidence to back up decisions, the importance of getting the message across to the wider public, and the lack of long term resources to deliver what is needed.

To help these efforts in Wales there is a huge resource of dedicated and active volunteers who have the potential to make a real difference as citizen scientists and through taking practical action. To engage these people we need to reach out to them in a language that is easily understood, and invest in the support needed to coordinate, encourage and value these people and the work they contribute.

For more details see **www.biodiversitywales.org.uk**

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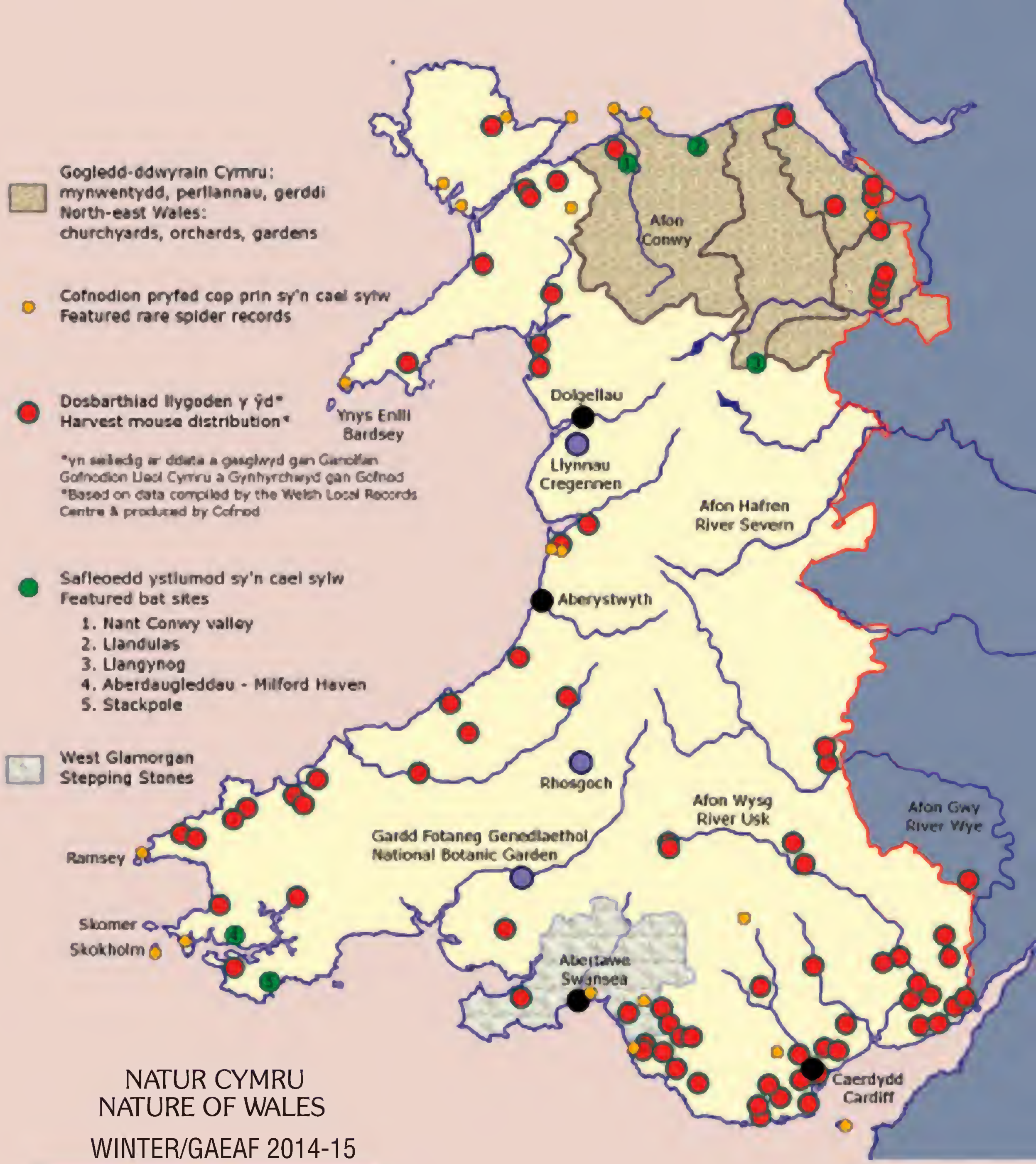
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